The Chemical Age

A Weekly Journal Devoted to Industrial & Engineering Chemistry

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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Other communications relating to advertisements or general matters should be addressed to the Manager.

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Some Points in the N.P.C. Report

FOLLOWING the summary of the conclusions of the Nitrogen Products Committee's Report which appeared in THE CHEMICAL AGE of last week, we now publish a further extended review of this historic document, with additional charts and tables. This will be the more appreciated because the Report was promptly sold out, and many of our readers, we fear, will be unable for some little time to obtain copies. There has been so much delay in connection with the publication of the Report that this final miscalculation as to the amount of public interest taken in the subject need excite no great surprise. It is, however, regrettable that, owing to the severe limitation of the first edition, the full Report will not be accessible to many who have long been anxious to learn its contents. It is well known that several who contemplated a trial of one or other of the processes mentioned in the Report have been waiting, before taking definite action, to obtain authoritative knowledge of the conclusions of the group of distinguished scientists who have been occupied for some four years in studying little else. To be deprived for a further period of this essential information in detail—which throughout the war has been freely and abundantly communicated to official representatives in the United States, France, Italy, Mysore, to mention only a few countries keenly interested in the commercial and political aspects of nitrogen fixation—will cause annoyance in this country, and even more perhaps in the Overseas Dominions and Dependencies—take, for instance, the cyanamide project at Assuan—where there are ample supplies of the water-power essential to the commercial success of some of the processes, and where the results of the Committee's investigations have long been eagerly awaited. This neglect of our domestic interests, vexatious as it is, must not be allowed to obscure the most excellent work which the Committee have accomplished.

We can recall no recent Government publication which excited more speculation and discussion prior to publication than the present Report, and now that it is made public it is possible to speak more freely about some points, such as the ill-starred Billingham project for the production of synthetic ammonia by the Haber process and its subsequent oxidation. This factory, it appears, was started against the better judgment of the Committee who had originally recommended the cyanamide scheme as most likely to produce definite results during the war period, but with some misgiving later agreed to the translation of the Haber process from a laboratory to a huge commercial scale on the assurance of the experts of the Department of Explosives Supply that the factory could be erected and, granted good priority, be producing in the following autumn—that is, just prior to the Armistice. This scheme was doomed from the start by lack of labour, low priority for both skilled labour and materials, and the continually changing front of various departments and Government Committees—an astonishing number—before whom the scheme came for review. The story of the efforts to force the Billingham scheme through, from its initiation to its eventual suspension, would make highly interesting reading if a history of the complete negotiations could be published. At the date work was stopped on this scheme, shortly after the Armistice, the buildings had hardly been started, though the actual commitments for cost of erection and materials and plant on order totalled, we have reason to believe, well over £1,000,000, a very high percentage of which will have to be written off as dead loss. Possibly, however, it is just as well that things happened as they did. The

Armistice provided an opportunity for British experts to visit some of the principal German plants, and (in spite of the quite natural German disposition to reveal as little as was necessary) to obtain valuable comparative information. We believe the broad effect of this was to show that the general lay-out and engineering details at Billingham left very much to be desired. While, however, the Billingham plant would have been purely experimental from the chemical engineering side, it is satisfactory to learn from the Report that the purely chemical work, judged by efficiencies and so forth, was distinctly in advance of the best German work, and further confirmation of this, we believe, may be obtained from those who have had an opportunity of seeing something of the most recent American installations. These points emphasise the importance of a vigorous development of the science of chemical engineering in this country, of which much has been heard of late and to which rather pointed reference was made at the last meeting of the London Section of the Society of Chemical Industry.

It is understood that many of those engaged in the recent investigations took very strongly the view that Billingham should be established as a State undertaking and thus afford the opportunity for the continuation of the research work under Government auspices. We understand, however, that arrangements have been practically completed for transferring the property to private interests, and it is not difficult to infer what these interests are, in view of the recent grant to a great British firm of licences in respect of enemy patents in connection with ammonia synthesis, and the retention of certain experts who were closely connected with the Munitions Inventions Department. In this respect the untimely death of Dr. H. C. Greenwood is particularly to be deplored, more especially as he seemed destined to be linked up with the interests in question. As it is, we are glad to feel that Billingham will be retained for the purpose originally contemplated, although many will regret that it is to be lost to the country for purely national purposes and State research.

Proposed Chemical Industry Schools

At a conference just held between Sir Robert Blair, chief education officer of the London County Council, and the Association of British Chemical Manufacturers, respecting a scheme for compulsory day continuation schools under the Education Act of 1919, a suggestion was made for the establishment of a chemical industry school, where pupils could receive not only a general education but special tuition in chemistry. According to the estimate of the chairman, Mr. W. J. U. Woolcock, M.P., about 15 per cent. of the total number of employees in chemical factories in the London area are boys and girls between 14 and 18 years of age, and on this basis provision will require to be made for 3,000 pupils engaged in the London chemical industry. So far as gasworks are concerned the corresponding percentage is from 10 to 12 per cent. It is obvious, taking the boys and girls in the London chemical industry alone who come within the provisions for compulsory continuation training, that more than one school will be required for the education of 3,000 pupils, and the distribution of the schools, therefore, in convenient centres is a matter of considerable importance. The scheme is one which enlightened manufacturers will welcome.

From the financial side, it may appear at first sight to have two disadvantages. It limits the supply of cheap boy and girl labour, because the time devoted to continuation day training will have to be deducted mainly if not wholly from working hours; otherwise, we are back on the old difficulty of sending children to classes in too tired a condition to benefit from them. Secondly, if boys and girls have to extend their educational period by three or four years, instead of becoming little wage-earning machines as soon as they leave school, they will reasonably expect a higher rate of pay as workpeople to compensate for the longer period of education. At first sight these may seem to the economically-minded employer changes not to be encouraged. The right view, however, is to regard any expenditure on more thorough technical training as an investment to secure a higher and more intelligent type of employee, and if this result is secured in the shape of greater efficiency throughout British industry it will well repay any temporary sacrifices made to attain it. It is satisfactory to note the favourable attitude of the Association of British Chemical Manufacturers to the scheme, and we shall hope to see in due course a number of well organised chemical industry schools established throughout the London area, and indeed in the principal chemical centres of the country.

During the discussion Sir Robert Blair raised the question as to the extent to which the chemical industry is a seasonal one, and the conference supplied the following interesting reply :—

Tar Distillers, Pharmaceutical and Fine Chemicals.—No season; busy all the year round.

Gas Companies.—Seasonal; winter the heaviest time.

Fertilisers.—Seasonal; autumn, winter and spring, busy; summer slack.

"Maison de la Chimie"

The chemical community of France have just taken a step which will give renewed interest to the idea of a central headquarters for British chemical industry, to which Sir William Pope referred at the recent dinner of the Chemical Industry Club. The Société de Chimie Industrielle considers that, with the revival of commercial activity, the time has come to establish a "Maison de la Chimie," in which the various scientific and technical associations, commercial interests, &c., may meet under a common roof for the purpose of study, discussion, business, &c. The realisation of this project will at the same time provide a meeting place for the "International Union of Pure and Applied Chemistry," the headquarters of which have been fixed in Paris. The "Maison de la Chimie" will be established on a business footing, and suitable premises will be purchased or constructed, and equipped. The institution will offer facilities for meetings of scientific, technical, and commercial men, for lectures, for work, for study and research, and a restaurant will be included. Such an idea had already been worked out by the "Syndicat Général des Produits Chimiques" and the "Société de Chimie Industrielle" as a business

investment. Rooms for meetings, conferences, exhibitions, &c., will be available for hire by various sectional bodies, while furnished offices completely equipped with lighting, central heating, telephone, &c., would be available to be hired by the month. It is expected that such facilities will be welcome by French provincial business men and chemists, who will thus be enabled to establish an agency in Paris at a minimum of expense. Further, the "Maison de la Chimie" will contain a club for the more intimate development of personal relations between scientific or business men having similar interests or engaged on the same class of work. French chemists who, during the late war, had occasion to visit other countries in their professional capacity, have much appreciated the value of the chemical clubs and similar organisations existing in England and the United States of America.

The Chemistry of Coal

THE Papers contributed by Dr. R. Lessing to the last meeting of the Chemical Society under the head of "Studies in the Composition of Coal," represent valuble original investigation in a field where further research is very much to be desired. Apart from the purely scientific interest of the contributions as regards the formation of bituminous coal, the results are of technical importance in their bearing on the mechanism of coal carbonisation and the type of coke and other products obtainable from coal containing the different constituents in varying proportions. The composition of the mineral constituents is important from the point of view of the coal-washing process, which is at present little understood, and is bound to become more general with the increase in cost as a means of refining coal. There is, further, the catalytic influence of the mineral constituents both on carbonisation and on spontaneous combustion of coal. Whilst the United States Bureau of Mines is filling our shelves with important publications, and the German Coal Research Institute released a string of valuable papers even during the war, no results of original investigation have yet been published by the Fuel Research Board. Work of this nature is left to private enterprise, and as Dr. Marie Stopes intimated at the meeting private enterprise among English chemists cannot be too confidently relied upon where the expense is immediate and the commercial return speculative or at best remote. The indebtedness expressed to Dr. Lessing, therefore, both as to the actual results of his investigations and as to the example of his action, was by no means an idle compliment.

Colloidal Clay in Soap-Making

THE article we published last week from Mr. F. E. Weston on the use of colloidal clay in soap manufacture has attracted widespread attention throughout the country. The public have seized upon it as supplying a hope of cheaper soap, and inquiries have already come in as to the commercial possibilities underlying Mr. Weston's investigations. As some of our correspondents point out, the use of colloidal clay as an "adulterant" is not unknown, but it by no means follows from this that its uses have been fully explored, and it often happens that even a small change in an existing process may radically affect commercial production. At this stage, however, it is too early to dogmatise. What is certain is that the results of Mr. Weston's experiments have excited great interest, and all that is asked for them at present is competent and impartial examination.

The Calendar

Jan. 26	Royal Society of Edinburgh. 4.30 p.m.	Edinburgh.
27	Manchester Municipal College of Technology (Dept. of Applied Chemistry): "Drying Machinery." E. A. Alliott, B.Sc. 4.30 p.m.	Manchester.
28	Institute of Chemistry (Irish Section): "The Functions and Duties of the Public Analyst." Paper by B. G. Fagan. 4.15 p.m.	Royal College of Science, Dublin.
28	Society of Chemical Industry (Newcastle-on-Tyne Section): Papers by J. Coggin Brown and T. W. Moore. 7.30 p.m.	Drawing Room Café, Brunswick Place, Newcastle.
29	Royal Society: Papers by Professors W. Batesman, E. W. MacBride and F. G. Hopkins. 4.30 p.m.	Burlington House, Piccadilly, London, W. 1.
29	Society of Dyers and Colourists (Bradford Junior Branch): "Some Defects Developed during Dyeing and Finishing." Professor E. Midgley.	Huddersfield.
31	Royal Institution of Great Britain: "Movement of the Perihelion of Mercury," Sir F. W. Dyson. 3 p.m.	Royal Institution, 1, Albemarle Street, London, W. 1.
Feb. 2	Royal Society of Edinburgh. 4.30.	Edinburgh.
3	Manchester Municipal College of Technology (Dept. of Applied Chemistry): "Filter Presses: Their Construction and Uses." T. H. Lait. 4.30 p.m.	Manchester.
4	Society of Public Analysts: Annual General Meeting. 8 p.m. Followed by Ordinary Monthly Meeting. Papers by F. S. Sinnatt and L. Slater and H. Trickett.	Chemical Society's Rooms, Burlington House, Piccadilly, London, W. 1.
5	Society of Dyers and Colourists (West Riding Section): "Development of the Chemical Industry in Switzerland during the War." Dr. J. B. Oesch.	Leeds.
5	Chemical Society: Informal Meeting. 8 p.m.	Burlington House, Piccadilly, London, W. 1.
6	Society of Chemical Industry (Bristol and South Wales Section): "The Bearing of Structure on the Breakdown of Metals." J. Myers. 7.30 p.m.	University College, Cathys Park, Cardiff.
6	Society of Chemical Industry (Manchester Section): Papers by Capt. F. S. Sinnatt and A. Grounds and T. Callan, J. A. R. Henderson and N. Strafford. 7 p.m.	Grand Hotel, Manchester.
10	Manchester Municipal College of Technology (Department of Applied Chemistry): "The Separation of Oxygen, Nitrogen and Rare Gases from Air by Liquefaction." C. R. Houseman. 4.30 p.m.	Manchester.
12	British Chemical Trade Association: Chemical Trades Dinner. 7 p.m.	Criterion Restaurant, London.

Synthetic Drugs and Chemicals

The Present Position of the Industry in Great Britain

The following article on the production of Synthetic Drugs and Chemicals in this country indicates the advances recently made in British production. It points out, however, that though much has been done, "a great deal more is necessary before this country can become self-supporting in regard to synthetic organic chemicals."

THE manufacture of synthetic drugs and other fine chemicals in this country has become an important branch of industry, and is now being conducted on a considerable and increasing scale. The majority of the synthetics essential for use in medicine and industry, which were formerly produced solely in Germany, are now obtainable from British manufacturers, though a few of them, such as chloral hydrate, paraldehyde, and sulphonal are still imported from America and France. Immediately on the outbreak of war the production of synthetic drugs was undertaken in this country, and within a few weeks salicylic acid and salicylates were being produced, all kinds of plant being requisitioned and modified for this purpose.

The early manufactures of these substances were not of a high degree of purity, but as our knowledge of the reactions grew and better plant became available, so the purity improved until a product was obtained fully equal to that of the best pre-war German makers. A number of factories throughout the country are now daily turning out large quantities of salicylates, sufficient for all home and export requirements.

The production of salicylic acid being successfully achieved, attention was next turned to acetylsalicylic acid (aspirin), but much research work was necessary before suitable processes were evolved. It was a comparatively simple matter to prepare small quantities in the laboratory using glass and porcelain apparatus, but such material cannot be used in the factory, and considerable trouble was incurred before satisfactory plant was devised, and a pure article could be turned out on a manufacturing scale. Aspirin of British manufacture has a higher melting point and is of a greater degree of purity than that previously turned out by most of the German chemical factories.

Samples of British Production

A great number of synthetic drugs are now being produced in this country, and the following may be cited as being typical of the variety of substances manufactured. Many of these were German specialities, the proprietary names of which are given in brackets.

ANAESTHETICS.—Aminobenzoic ester (anaesthesin), benzamine (eucain), kerocaine (novocaine), methyl-amino-oxybenzoate (orthoform). The manufacture of these most important bodies was undertaken early in the war, large quantities being required for the Army.

ANTISEPTICS.—Chloramine T, dichloramine T, acriflavine, proflavine. These were in great demand for the treatment of wounds.

CARBOHYDRATES.—Dextrose, used for artificial feeding and for intravenous injection after operations, levulose, maltose, mannitol, dulcitol.

HYPNOTICS AND SEDATIVES.—Acetophenone, chloralformamide (chloralamide), bornyl valerate (bornyval), menthyl valerate (validol).

VENEREAL REMEDIES.—Intramine, di-ortho-amino-thiobenzene, kharsivan (salvarsan), neo-kharsivan (neo-salvarsan).

Acetannin (tannigen), methylene-ditannin (tannoform), hexamine-resorcin (hetralin), thymol iodide (aristol), iodatol (iodipin), pyrogallyl monoacetate (eugallol), pyrogallyl triacetate (lenigallol), resorcinyl acetate (euresol), anisole, benzoates, camphorates, formates, hippurates, lactates, and valerates.

Saccharin might be included in this list of drugs although it has no medicinal value; during the sugar shortage its sweetening property was of the greatest use to the country. Sufficient is now manufactured in this country to meet all home requirements. The kind produced consists solely of the 550 or pure ortho-benzoic-sulphinide, the impure variety containing para-sulphobenzoic acid and known as 330 saccharin not being put on the market.

The enormous quantities of high explosives manufactured during the latter period of the war show that in this branch of organic chemistry we not only equalled the Germans, but left them far behind. Again, in regard to mustard gas, British chemists in the laboratory and dye factory so improved on the original process of manufacture used by the enemy that the Allied production was about thirty times greater, and the cost thirty times less, than that of the Germans.

Dyestuffs and Intermediates

With regard to dyestuffs and intermediates, the supplies of these are by no means equal to all demands. The number of different dyes available is less than was the case in pre-war times. The textile trade absorbs most of the dyestuffs produced in the dye factories, and the latter naturally devote all their energies to turning out the colours particularly needed in this industry. In consequence of this a number of dyes, which are used solely for scientific purposes, such as bacteriology and microscopy, are almost unobtainable in this country, *e.g.*, methyl green.

Without doubt a very large number of the pre-war dyes were superfluous, many of them, though sold under different names, being identical. At the British Science and Key Industries Exhibition recently held in Glasgow, the British Drug Houses, Ltd., showed a number of dyes specially prepared for microscopical purposes. The manufacture of these was undertaken during the initial shortage early on in the war, and the whole of the stains on view are guaranteed to consist solely of dyestuff, and to be free from diluent.

These particular dyes are not obtainable from the dye factories, and their use is confined almost entirely to microscopy, the quantities required for this purpose being infinitesimal in comparison with those of the dyes needed for textile purposes.

The same firm also exhibited a number of synthetic chemicals for use as reagents in analytical and research work, such as cupferron, hydroxylamine hydrochloride, succinic acid, nitroso-beta-naphthol and di-phenyl-thiourea. For this purpose a very high degree of purity is necessary, the ordinary technical quality being useless. These substances are of very great importance, and were in demand for the testing of munitions.

Indicators form a group of organic bodies which show a change of colour according as the liquid in which they are dissolved is acid or alkaline. Like the majority of dyes they are either acid or basic in character, and while some are extremely sensitive to weak acids, others will react only with strong acids. Indicators are used in chemical analysis, and although the quantities required are small, they are indispensable. Of these, phenolphthalein is the principal one; this is also used medicinally as a purgative, and small quantities have been made in this country for several years. Methyl orange and methyl red are British, and latterly there have been produced some of the newer indicators—orthocresol, alpha-naphthol and thymol phthaleins, orthocresol, phenol and thymol sulphone-phthaleins, and their bromine derivatives.

Alcohols, &c.

Alcohols and esters comprise another group of synthetic substances of great industrial importance. Methyl alcohol obtained from wood spirit is not produced here to any extent. Ethyl alcohol up to about 95 per cent. was British in pre-war times, as was amyl alcohol prepared from fusel oil. The distillation of absolute ethyl alcohol and the preparation of propyl, isopropyl, butyl, isobutyl, and the amyl alcohols by fermentation methods are now being carried out on a large scale. These liquids are finding increasing application in the arts as solvents.

The esters of these alcohols with organic acids, such as formic, acetic, butyric, caproic, caprylic, benzoic, cinnamic, salicylic and valeric, are produced, some for use in perfumery and flavouring essences, others as solvents in the maufacture of varnishes and aeroplane dope.

Other bodies prepared for use in perfumery are aldehydes, such as benzaldehyde, benzyl alcohol and its esters, artificial musk, coumarin, heliotropin, ionone, phenyl-ethyl alcohol, and vanillin, together with a host of other substances too numerous to mention.

The use of aeroplane dope called for the production of such diverse substances as cellulose acetate, nitro-cellulose, triphenyl-phosphate, acetone, ester gums and a number of chlorine substituted hydrocarbons such as trichlorethylene.

The manufacture of photographic chemicals has also been successfully undertaken, and the following of British manufacture are now obtainable—amidol, metol, glycin, hydroquinone, paramidophenol, pyrogallic acid, and thiourea.

During the last five years our energies have been concentrated on the production of those bodies most essential to the nation. Of the thousand and one things turned out by the German chemical factories many were by-products of little or no medicinal value; many were unnecessary, and were little missed when the supply was suddenly cut off. Much has been done, but a great deal more is necessary before this country can become self-supporting in regard to synthetic organic chemicals.

Manchester University's Appeal

The New Department of Colloid Chemistry

To the Editor of THE CHEMICAL AGE

SIR,—You will need no assurance that your recent sympathetic references to the appeal which this University is now making for financial assistance are warmly appreciated, and not least by us who have to carry on, as best we can, the work begun by Frankland, Roscoe, and the other great English chemists whose names will always be linked with the traditions of this school. It is natural that you should have dwelt especially on the Chemistry department; certainly its needs are urgent if the tradition is to be maintained that research should be an integral part of a chemist's training. But, while we should have no difficulty in making out a convincing claim for this department in particular, it must not be forgotten that the high standard of any honours school is largely dependent on a similar standard in related subjects, and the appeal is very properly made for the University as a whole. If the appeal is supported in the manner and on the scale which the university as a whole deserves, we do not fear that the chemistry department and its research will fail to secure adequate support from the general university funds.

This university in the past has been distinguished for its whole-hearted support of research, and the expenditure incurred on chemical research had its return in a reputation maintained for more than fifty years—a reputation which your article shows has not been forgotten by the outer chemical world.

The project of a new department for the study of colloids is one which had its inception outside the university, a group of progressive firms having set out to collect independently the sum of £25,000, to be devoted to a chair in the subject. It is intended that the subject should be treated in the broadest possible way, both from the physical and the chemical aspects. Training would be given to students and others already well prepared in chemistry and physics, and research work on colloids would be carried on by staff and pupils.

The department would be the first of the kind in this country, where the great importance of colloids as a subject of close study has received but tardy recognition. A great institute for the purpose has existed in Germany for some years, and there is evidence that in America large developments on the same lines may be expected in the near future.

Even at the present time it is not generally realised how vast are the applications of the study of colloids, and probably many whom it most nearly concerns are ignorant of the meaning of the word. Their applications are important, not only from the scientific point of view, but also in medicine, agriculture, and industry. In the industrial district served by this university the study of colloids will react powerfully on the textile, ceramic, soap, margarine, photographic, dyeing, and other industries, for many of the materials (often the essential ones) dealt with are actually colloids. An expenditure by these industries on teaching and research in colloids will inevitably be returned with interest in the application of discoveries made and in the production of men skilled in the subject.

The sum of £25,000 which the group of firms has set out to collect will render it possible for the university to make a beginning. But as the new department grows, as it inevitably must, the cost of carrying it on will be covered only partially by such an endowment, and will have to be largely defrayed from the general university funds. The ultimate success of this scheme, no less than the future of our own chemistry department, is therefore bound up with the success of the general university appeal, and provides further inducement, if any be necessary, for generous public support of that appeal.—We are, &c.,

HAROLD B. DIXON,
ARTHUR LAPWORTH.
(Professors of Chemistry in the Victoria University of Manchester.)

Chemistry Depart., The University, Manchester, Jan. 16.

Manchester University Colloid Fund

THE term "colloid" literally means a "material like glue." Although many colloids do not possess glue-like properties, they have certain characteristics which justify their being grouped together. Some, by the use of suitable solvents, can be made into gummy solutions; they include many of the most important raw materials of industry, such as gelatine, gums, rubber, starch and other sizing materials, cotton and cellulose generally, wool, silk and other textile fibres. Others do not form such thick solutions.

In either case, research has shown that colloids consist of very small solid or liquid particles, which range in size between two limits. Roughly speaking, the particles are so small that they can pass through blotting paper, but are too large to pass through parchmentised paper or a thin film of collodion. Some substances, like salt, when dissolved in water can easily pass through such filters, but when suitably prepared in other liquids they are incapable of doing so. In the latter case they are in the colloid form. When such tests are applied to dyes, it is found that many of them are colloidal.

These small particles have some chemical and physical properties very different from the same materials in coarser condition. It is these properties which require special study, and which make the provision of a separate department at the university necessary.

A knowledge of the properties of colloids is essential to the progress of some of our main industries. The fibres used in the textile and paper industries, the sizes and many of the dyes are colloidal. The china clays of the pottery industries are also colloids. Colloids form the intermediate products in the manufacture of certain metals. The rubber, tanning, photographic, soap, dairy and margarine industries are dealing mainly with colloidal matter. The fertility of soils under modern intensive culture depends less on their chemical character than on their colloidal condition, and 60 per cent. of the solids of sewage are colloids.

Reviews

INDUSTRIAL GASES. By H. C. Greenwood, O.B.E., D.Sc., F.I.C. London: Ballière, Tindall & Cox, 1920. Pp. xvii., 371. 12s. 6d. net.

One of the most gratifying symptoms of increased scientific activity in this country, particularly in the application of science to industry, is to be found in the high standard of excellence of a large number of the many text-books which have been published both during and since the termination of the war. The present volume, which forms one of the well-known series on industrial chemistry edited by Dr. S. Rideal, summarises in an extremely clear and readable manner the manufacture, properties, and uses of the principal industrial gases.

An introductory section, in addition to dealing rather cursorily with many of the general properties of gases treated in greater detail in other text-books, contains sections on the flow of gases through tubes, on the manipulation of compressed and liquefied gases with particular reference to storage in cylinders, and on heat interchange. Tables are appended summarising many of the constants of technical gases.

Following this introduction, the work is divided into three parts, dealing respectively with the gases of the atmosphere, various non-atmospheric gases (but including carbon dioxide) and gaseous fuels. The section devoted to air deals almost exclusively with the liquefaction and separation of air into its constituents. Cooling by means of the Joule-Thompson effect receives detailed mathematical treatment, and a description is given of typical liquefaction and separation plants utilising expansion both with and without the production of external work. Succeeding sections deal with the properties of oxygen and nitrogen.

The rare gases of the atmosphere have, during the past few years, assumed considerable technical interest by reason of their use in the manufacture of electric lamps and for the detection of Hertzian waves, while the employment of helium on a large scale for filling air ships marks as great an advance in the preparation of this hitherto rare element as did the commercial production of thoria and ceria some 25 years ago in connection with the development of the incandescent gas mantle. It is instances such as these which show that few elements exist which cannot be made available on a large scale, provided that a real need for them arises.

The second part of the book, which deals with hydrogen, carbon monoxide, carbon dioxide, sulphur dioxide, nitrous oxide, and asphyxiating gases—hydrogen being treated especially fully—contains extensive data relating to technical production and experience. The necessity for treating asphyxiating, lachrymatory and poisonous gases as industrial products is, from the standpoint of chemical ideals, the outstanding deplorable effect of the late war. The remainder of the work is occupied by a consideration of gaseous fuels, principally of the water-gas and producer-gas types. A feature of particular interest in each section is the inclusion of data relating to the cost of production of the various gases, and, as far as is possible, notes indicating the extent to which each process has been adopted in practice. In many cases the approximate capital cost of an installation of a given capacity is also mentioned, all figures being based on pre-war rates.

The book is remarkably free from errors, and is written in a manner which pays a striking tribute to the thoroughness and ability of the author, whose untimely death on November 4, 1919, has already been recorded in these columns (p. 599 of 1919). In this connection, the remarks of Dr. J. A. Harker in the foreword to the volume will be most heartily endorsed by all who knew Dr. Greenwood either personally or by reason of his published work.

The division of the book into sections instead of chapters would seem to amount to nothing more than a mere departure from the usual name; but the resumé of literature, including works of reference, at the end of each section will be found extremely convenient for obtaining more detailed information than can be included in a general text-book of moderate size.

On the whole, Dr. Greenwood's work will be found to be one of the most complete books of its size on the subject treated, and its acquisition may be most confidently recommended to all interested in recent developments in the technology of industrial gases. E. B. M.

A TREATISE ON QUALITATIVE ANALYSIS. By Frank Clowes, D.Sc., and J. Bernard Coleman, A.R.C.Sc. Ninth Edition, with 84 illustrations. J. & A. Churchill, London. Pp. 416. 12s. 6d.

The fact that this volume is of the ninth edition is sufficient testimony to its deserved popularity among students and teachers. The new matter incorporated deals mainly with the rarer elements and specific organic substances. Not the least important feature is the adoption of standard strengths of laboratory solutions, and the arrangement of tabular matter across instead of along the page will add considerably to its convenient use on the laboratory bench. In spite of its continual revision, misprints have yet crept in. For example, an incorrect boiling point of aniline is quoted on page 179, and occasionally cross-references are misquoted.

The authors have restricted themselves mainly to such reagents as are commonly found on laboratory benches, and "fashionable" tests such as the use of dimethyl glyoxime and the exceedingly sensitive dithiooxalates in connection with nickel and cobalt, are not mentioned. The use of "tetra base," on page 243, is limited to ozone, when it might have been extended. In a few cases alteration of phrasing would result in greater accuracy; thus the statement on page 224, that all primary aromatic amines give the diazo reaction, needs qualification, and many chemists would question the assertion on page 238 that atropine occurs as such in Atropa belladonna.

If it is not in the nature of adding hues to the rainbow, we would suggest that in a future edition the authors would earn the gratitude of both students and demonstrators if they could include spark spectra in the section devoted to spectrum analysis. Where classes of students are large the time lost by referring to the very few copies of *Boisbaudran* that are available is considerable, and the insertion of such spark spectrum charts in each student's text-book would be much appreciated. Further, it would be an advantage if the spectrum charts were printed in colours; this might add to the expense of production, but it would make a great difference to the student when he is learning to recognise spectra by appearance and not by scale divisions.

We would commend this volume to students as being the work of two expert teachers. The explicit directions it contains and its lucid expression leave little to be desired, and render unnecessary the constant recourse to a demonstrator's explanations which ill-written practical manuals so often necessitate. D. I. J.

LABOUR DIFFICULTIES AND SUGGESTED SOLUTIONS. By W. J. Deeley, B.A. Benn Brothers, Ltd. 10s. 6d.

This volume may be confidently commended to all interested in the subject of works management. It deals especially with the management of workers, and is one more sign of the recognition of the importance of studying the human side of industry. It is true that the art of "handling" men is in the main a natural one; it is a matter of personality. One man, with the necessary personal qualities, will run a works and get the best out of the workers without any elaborate paper system, and granted that these necessary qualities are present it is, perhaps, the simplest and most effective way, for the most efficient "system" sometimes is that which employs little or no system at all, but consists in right judgment and instincts. But the born leader of men is not always available for the boardroom or the workshop, and although study and calculation can never really amount to sight they may serve as tolerable substitutes. In any case, the most successful manager will not be wasting his time by studying Mr. Deeley's suggestions, while the less successful, especially the young and inexperienced, may learn much and possibly save themselves from trouble in their workshops. A helpful feature of the book is the introduction of exercises at the end of the chapters. In this way the reader is invited to apply for himself the principles laid down by the author to specific cases, and he will be interested to compare his own decisions with those suggested by Mr. Deeley. The book will serve a useful purpose if it convinces all who have managerial responsibilities in works that the secret of success is a psychological understanding of the workmen and an honest desire to deal fairly with them. H.

Final Report of the Nitrogen Products Committee

Full Review with Additional Tables and Diagrams

Last week we were able to give, immediately on its publication, a brief but clear summary of the Final Report of the Nitrogen Products Committee. We now publish a full review, prepared by one intimately familiar with the work of the Committee, together with additional tables and diagrams. In regard to the Committee's estimates of costs, it should be pointed out that the Report was presented last May and therefore costs which have generally been given on a pre-war basis, particularly in the case of power production based on coal at 7s. 6d. to 10s. per ton, require to be substantially revised. Copies of the Report may be obtainable from H.M. Stationery Office, Cmd. 482, 4s. pp. vi., 357, but it is stated that the first edition is already sold out.

THE report is of so exhaustive a character that only a complete study of the document itself can satisfy those who require thoroughly to master its contents. It may be possible, however, to indicate its substance and its range by means of a comprehensive review. It should be understood that the necessity for the inquiry which the Committee conducted arose out of war conditions, and that the vital object in view was not scientific and technical research for its own sake, but national safety—in other words, the manufacture in sufficient quantities and independently of foreign supplies of chemical products indispensable to the production of explosives. The fact, however, that the work was primarily intended to supply the needs of war does not lessen the importance of its bearing on peace industries, particularly agriculture, for, as the Germans foresaw long before ourselves, many key industries are rapidly convertible from peace applications to war applications, and both purposes have to be kept concurrently in view.

Regarding, then, national security as vitally dependent on our nitrogen resources the Committee recommend, among other things, the immediate erection in the United Kingdom of nitrogen fixation installations, the establishment of which would constitute a new key industry and require the active support of the Government. The main recommendations involve the production of nitrogen from the air on a large scale for the manufacture of fertilisers and fertiliser materials, capable not only of meeting the growing requirements of agriculture and maintaining our export trade, but in time of war of being rapidly converted into chemicals essential for the manufacture of munitions.

As a minimum provision for safe-guarding the future and for meeting a portion of the home demand for nitrogen products, the Committee recommend, in the first place, that a factory for the production of calcium cyanamide on a scale of 60,000 tons per annum should be erected in Great Britain without delay, either by private enterprise supported if necessary by the Government, or as a public work. The estimated cost, if the necessary electrical energy is obtained from water-power on a site which has been carefully surveyed in Scotland, is estimated to be, on the basis of pre-war prices plus 50 per cent., £1,680,000; if, on the other hand, the industry is established in connection with one of the super-power stations proposed by the Board of Trade Committee on Electrical Power Supply, the cost would be £800,000. The chemical sections for either site would cost about £445,000 of the above total.

Secondly, the Committee recommend that the manufacture of synthetic ammonia by the Haber process should be established forthwith and extended up to a minimum manufacturing scale of 10,000 tons of ammonia, equivalent to 40,000 tons of sulphate of ammonia per annum. The estimated cost upon the basis of pre-war prices, plus 50 per cent., is £600,000 if ammonia is the final product, and £780,000 if the factory is laid out for converting the ammonia into sulphate of ammonia.

It is also recommended that in conjunction with the synthetic ammonia factory a plant for the oxidation of ammonia to nitric acid should be erected, as was originally contemplated by the Government, on a scale sufficient to produce about 10,000 tons of 95 per cent. nitric acid per annum or its equivalent in nitrates, and that the plant should be designed to utilise either synthetic ammonia or ammonia produced as a by-product from coal. The estimated cost of such an installation is put at £120,000.

National Value of Nitrogen Fixation Processes

The importance of these recommendations for the establishment of nitrogen fixation industries in Great Britain and of other recommendations will be readily understood when it is remembered that nitrogen in the form of nitric acid and ammonia is an essential constituent of practically all explosives and that the world's production of food is becoming more and more dependent on the use of nitrogenous fertilisers.

The cyanamide process produces primarily cyanamide or its commercial form "nitrolim," a fertiliser containing about 18 per cent. of nitrogen. The cyanamide can be readily converted into ammonia, and the ammonia from this or from the synthetic ammonia process can be turned into sulphate or nitrate of ammonia or transformed by the oxidation process into nitric acid for munitions and industrial purposes. An intermediate product of the cyanamide process is calcium carbide, of which nearly 30,000 tons are imported into the United Kingdom every year, and the demand for which in connection with oxy-acetylene welding, metal-cutting, lighting, and various chemical industries is rapidly increasing.

Though the incentive to the commercial establishment of nitrogen fixation may be said to have originated in this country as the result of the researches of the late Sir William Crookes and the experimental work of the late Lord Rayleigh upon the fixation of atmospheric nitrogen by means of the electric arc, no steps were taken in the United Kingdom to obtain nitrogen compounds other than the cyanides synthetically. While countries like Norway, Sweden and Germany were prompt to follow up these discoveries, Great Britain continued to rely on Chile for her supplies of nitrate of soda; and the ammonia recovered at gas works and coke-ovens has constituted practically the only form of combined nitrogen produced in this country.

This position was rendered more serious by the fact that the supply of ammonia nitrogen from our by-product industry declined in 1914 and 1915, and in 1917 was only about 6 per cent. in excess of the production in 1913. Moreover, the Committee say "large quantities of ammonium sulphate, amounting in 1915 to nearly 70 per cent., and in 1916 to nearly 60 per cent. of the total production of ammonia nitrogen, were exported from this country even after the outbreak of war. This not only depleted the supplies of sulphate for agricultural purposes, but also involved the consumption of large quantities of sulphuric acid, for which there was a greatly increased demand for munitions. It is worthy of note that exported ammonium sulphate represented a minimum consumption of 294,000 tons of chamber acid in 1915, and a minimum of 259,500 tons in 1916." How narrowly we escaped disaster by the pursuit of this policy is easily seen from the Nitrogen Products Committee's report. At a critical period of the war the position in regard to the continued adequate supply of munitions became of the gravest character, as the result of the continued sinking by submarines of cargoes of Chilian nitrate of soda.

Germany's War Progress

The position in this country during the war was in sharp contrast to that of Germany. Before the war Germany was the world's largest producer and consumer of by-product sulphate of ammonia and the world's largest consumer of Chilean nitrate. In 1913 Germany consumed 480,000 tons of sulphate alone out of a production of 521,000 tons, 20,000 tons only of which was synthetically produced, and 750,000 tons of Chilean nitrate. The total German production of nitrogen products in 1913 represented 110,000 metric tons of nitrogen. It is estimated that in 1917 her total requirements represented 415,000 metric tons of nitrogen, showing a deficiency of 305,000 metric tons, and the cessation of imports rendered it essential to make up the deficit as far as possible by augmenting home production.

In addition to increasing the output of her by-product ammonia industry from 413,000 metric tons of ammonia sulphate in 1914 to an estimated total of 700,000 metric tons in 1917, Germany resorted for the manufacture of the essential nitrogen compounds to synthetic processes on the perfection of which she has spent many millions of money. By means of the Haber process and the oxidation process, untried in this country before the war, Germany rendered herself secure, so

far as munitions went, until her chemical factories were bombed by the Allies.

It is estimated that the actual production by the synthetic ammonia process in Germany was extended from an actual 60,000 tons of sulphate of ammonia in 1914 to 500,000 tons in 1917, and that the ammonia oxidation process, though only capable of producing nitric acid at the rate of 120,000 tons per annum in 1916, was expanded to meet the military requirements of the Central Powers, which were estimated to be 450,000 tons in 1917. The cyanamide industry was also expanded to such an extent that, although only having an output of 24,000 tons of cyanamide in 1913, it had an estimated minimum productive capacity of 500,000 tons in 1917. By the use of these processes Germany is estimated to have produced in 1917 nitrogen products equivalent to 320,000 metric tons of nitrogen, thus more than wiping out the deficit, and it is probable, the Committee say, that these figures are not altogether complete, as processes other than those mentioned are believed to have yielded substantial results. Germany's success, indeed, lends colour to the theory that she did not declare war until she saw her way clear to produce within her own borders by synthetic processes all the nitrogen products required for a great war.

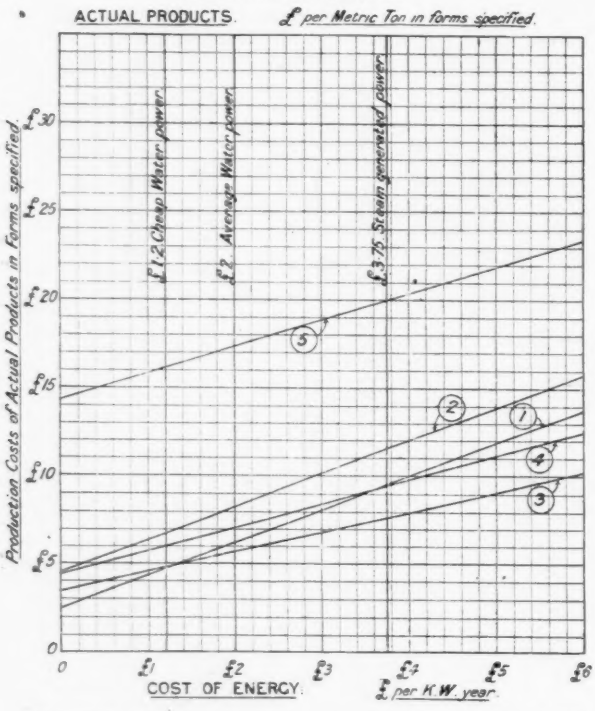
The British Position

The Committee state that the existing sources of supply of combined nitrogen in the United Kingdom proved wholly inadequate for meeting the war demands, and that they must be considerably increased if the present and prospective home demands are to be met and the pre-war scale of exportation maintained. They also point out that the nitrogen fixation industries developed in Germany during the war represent post-war assets of considerable value, and it is probable that they will not only enable that country to meet increasing requirements for ammonia and cyanamide nitrogen for some years to come, but will place her in a strong position for competing in the nitrogen markets of other countries.

In a section discussing the influence of the war on future policy the Committee state that if a country is to rely on the retort (Chile nitrate) process for meeting a war demand of the magnitude necessitated by the conditions of modern warfare that country must be prepared (assuming, of course, that Chile is not a belligerent) to face a heavy demand on shipping,

Influence of Cost of Energy on Production Costs

Chart A: Arc Process.



(1) HNO_3 (calculated as 100 per cent.) in the form of Dilute (30-40 per cent.) acid.

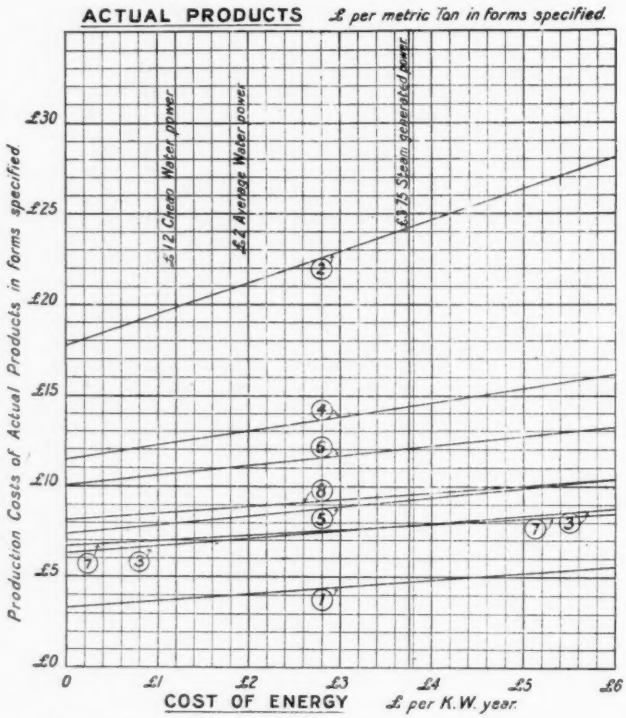
(2) HNO_3 (calculated as 100 per cent.) in the form of Concentrated (93-96 per cent.) acid.

(3) Lime Nitrate (packed) (13 per cent. N) via neutralisation of dilute acid from arc process, including production of acid.

(4) Sodium Nitrate (packed) (15·6 per cent. N) via neutralisation of dilute acid from arc process with soda ash at £3 per metric ton, including production of acid.

(5) Ammonium Nitrate (unpacked) (35 per cent. N) via neutralisation of dilute acid from arc process with by-product ammonia, including production of acid and also cost of crude ammonia liquor upon basis of pre-war market price of sulphate with allowance for losses in and cost of purification of Ammonia.

Chart B: Cyanamide Process (continuous)



(1) Raw cyanamide (19·5 per cent. N).

(2) Ammonia as pure liquor (20-25 per cent. NH_3) including carbide-cyanamide stages.

(3) Ammonium sulphate (packed) (25 per cent. NH_3), including carbide-cyanamide, ammonia and sulphate stages.

(4) Ammonium nitrate (unpacked) (35 per cent. N) via oxidation of cyanamide ammonia and neutralisation of resulting nitric acid with cyanamide ammonia, including carbide-cyanamide, ammonia, and ammonia oxidation stages.

(5) HNO_3 (calculated as 100 per cent.) in form of dilute (50-53 per cent.) acid, via oxidation of cyanamide ammonia including carbide-cyanamide, ammonia and ammonia oxidation stages.

(6) HNO_3 (calculated as 100 per cent.) in form of Concentrated (93-96 per cent.) acid, via oxidation of cyanamide ammonia, including carbide-cyanamide, ammonia, ammonia oxidation and concentrating stages.

(7) Lime nitrate (packed) (13 per cent. N), via oxidation of cyanamide ammonia and neutralisation of resulting nitric acid, including carbide-cyanamide, ammonia, and ammonia oxidation stages.

(8) Sodium nitrate (packed) (15·6 per cent. N), via oxidation of cyanamide ammonia and neutralisation of resulting nitric acid with soda ash at £3 per metric ton, including carbide-cyanamide, ammonia and ammonia oxidation stages.

a large advance in the price of imported materials, and a consequent increase in the cost of products manufactured from them.

Reliance upon synthetic methods for a war demand would mean that a country must be prepared to face a large initial capital outlay, but as compared with the Chilean nitrate process "two years' expenditure upon imported raw material would alone more than cover the estimated pre-war capital outlay for synthetic installations capable of furnishing the same amount."

Insisting that nitrogen processes are thoroughly reliable even when installed as emergency measures under war conditions, and that very serious risks are involved in relying upon overseas shipments of raw material, the Committee say: "The conclusion seems evident that considerations of national safety, of finance, and of utility would force a country to resort to a policy of adopting synthetic methods as an insurance against future emergencies instead of placing reliance upon the importation of Chilean nitrate."

An Empire Nitrogen Policy Proposed.

Having carefully surveyed the possibilities of establishing nitrogen fixation plant in different parts of the Empire, the Committee recommend that a co-ordinated policy should be framed for safeguarding the future nitrogen requirements of the Empire, and that this should be done by an Imperial authority. The moral of the Committee's investigation is that the nitrogen situation in this country must be remedied immediately. Though there may never be a repetition of the circumstances of the recent war the risk that has confronted the Empire is too great ever to be incurred again.

Manufacturing Costs of Synthetic Products

The outstanding feature of the report is the detailed investigation of the comparative costs involved in manufacturing various nitrogen products by different processes comprised in Appendix V. (which surveys the whole of the well-established and partly developed methods of nitrogen recovery and fixation). It is obvious that the work entailed must have been considerable, because little or nothing was known from practical experience in this country of the financial aspects of and the power requirements for nitrogen processes, and the information has for the most part been jealously guarded by firms engaged in commercial undertakings.

The capital and running costs are summarised in two tables (see pp. 92-94), which show at a glance the relative costs of various products by different methods of manufacture. The whole of this appendix and the section in the report commenting on it deserve the closest perusal. Some of the matters with which it deals may be briefly reviewed.

The Arc Process

The adoption of the arc process in Great Britain is rejected on the ground of its large power requirements, its low electrochemical efficiency, and the extensive and costly character of the necessary plant. Notwithstanding these handicaps, the arc process (with electrical energy at £3. 15s. per kilowatt-year—a figure that is not now likely to be realised—could produce concentrated nitric acid at a factory cost of £11 10s. per ton, as compared with £22 6s. by the Chile nitrate retort process. There are undoubted possibilities of improvement in the process, and while making no definite recommendation the Committee think that if large central stations for power supply are erected in this country the process might provide a useful outlet for a substantial block of off-peak power, and be well worthy of consideration as a commercial proposition for the manufacture of nitric acid.

Calcium Cyanamide Process

The Committee's recommendation regarding the production of cyanamide (to be used as such in agriculture or for the production of ammonia) confirms that made in their Interim Report in February, 1917. The scale of production now advised, however, is 10,000 tons per annum higher than it was then.

The advantages claimed for the process are: Its relatively small power requirements; the direct production of a solid nitrogenous fertiliser, thus avoiding the costs incurred in other processes for converting liquid products into solid marketable form; the production of a cheaper marketable form of combined nitrogen than that obtainable by any other established fixation process; and its great adaptability as regards the products obtainable.

Cyanamide, the Committee estimate, can be made for about £24 per ton of fixed nitrogen (equal to over 5 tons of actual, cyanamide); on the basis of pre-war prices, plus 50 per cent. the approximate factory costs would not exceed £6 8s. at a water-power site, and £7 at a steam-power station, using coal at 11s. 3d. per ton—at present an impossible figure. Carbide could be manufactured for about £5 per ton, exclusive of the cost of packing in drums. It is suggested that the industry might be established in Scotland, but, failing the development of water-power there, plans are accessible for a factory in connection with a super-power station that may be erected in England.

The Haber Process

Assuming that pure hydrogen can be made for 2s. 6d. per thousand cubic feet—and the Committee consider that this may ultimately be done—the Haber synthetic ammonia process is capable of producing ammonia for about £17 per ton, and sulphate at about £6 per ton, as compared with the pre-war market price of £13 12s. The power requirements of this process are smaller than those of any other established method of fixing nitrogen, and on account of the purity of the synthetic ammonia it is specially suitable for use in conjunction with the oxidation method for the manufacture of nitric acid and nitrates.

Ammonia Oxidation Process

From the cheapest synthetic ammonia nitric acid can be produced by the ammonia oxidation process at an estimated cost of £9 8s. to £9 16s. per ton, as compared with a cost of £22 6s. by the Chile nitrate retort process. Even with by-product ammonia charged at its full pre-war market price, the cost of strong nitric acid should not exceed about £20 per ton. Using synthetic ammonia, nitrate of ammonia, which had a pre-war market price of about £35 per ton, can be produced for about £11. With by-product ammonia charged at its full pre-war market price, the production cost should not exceed about £26 per ton.

Conservation of By-product Ammonia

The Committee have devoted considerable attention to the problem of conserving the quantities of ammonia nitrogen wasted at gasworks and coke ovens in this country, and Appendix III. is devoted to a very careful and thorough survey of the whole of the sources of production. They recognise that no very large increase in the output of by-product ammonia in Great Britain in the immediate future seems probable, and advocate that the responsible organisation of the by-product ammonia industries should take steps to formulate definite standards of efficiency in ammonia recovery, and that the Local Government Board should be given powers to ensure their observance.

It is also recommended that gasworks should be compelled to put into practice various simple expedients that have been proved to result in a considerable diminution in the loss of ammonia by volatilisation and otherwise, and that in the national interests works should be required to co-operate in a comprehensive scheme of ammonia recovery and collection which it is recommended should be devised by the responsible organisation of the gas industry.

It is urged that steps should be taken to ensure the replacement at a much more rapid rate than hitherto of non-recovery coke-ovens of the beehive type by recovery ovens, in order that the reserves of coking coal shall be used to the maximum advantage.

Further, to ensure the better utilisation of our national coal resources and to reduce the consumption of raw coal as fuel, encouragement should be given to all efforts to extend the use of coal gas and coke for domestic purposes and for industrial requirements generally.

Chile Nitrate *v.* Synthetic Products

A very detailed study is made in the report and in Appendix V. of the financial and other aspects of the Chile nitrate industry. The Committee have investigated how far the market price of Chile nitrate could be reduced without loss to producers under the stress of keen competition with synthetic nitrogen products. They consider that if substantial reductions were made in the cost of extraction and in freight rates, and if the Chilean Government, rather than lose the market, reduced the export duty from £2 16s. 10d. to 10s. per ton of nitrate, £7 per ton would represent the lowest possible price at which nitrate could be put on shore in England or on the Continent. Such a price would represent no profit whatever

Production Costs of Nitrogen Compounds

Factory Costs of Unpacked Products Unless Otherwise Specified, Exclusive of Royalties and Like Payments

£ per Metric Ton of Combined Nitrogen in Form Specified

(Figures in Italics show the Cost of each Product in £ per metric ton)

INITIAL PROCESS OR PRODUCT.		PRODUCTS OBTAINED BY DIFFERENT PROCESSES OR COMBINATIONS OF PROCESSES.							
		1. PURE AMMONIA (calculated as 100 p.c.) as liquor (20-25 p.c. NH_3).	2. AMMONIUM SULPHATE (25 p.c. NH_3) (packed).	3. CALCIUM CYANAMIDE (19·5 p.c. N) (Raw).	4. HNO_3 (calculated as 100 p.c.) as dilute acid.	5. HNO_3 (calculated as 100 p.c.) as concentrated acid.	6. NITRATE OF LIME (13 p.c. N) (packed).	7. SODIUM NITRATE (15·6-15·65 p.c. N) (packed).	8. AMMONIUM NITRATE (35 p.c. N).
CHILE NITRATE									
Col. (5). Factory costs in United Kingdom based on market price of Chile nitrate.	Based on pre-war (average 1911-13) market price.	...	...	...	...	100·48 *22·33*	...	67·21 *10·52*	84·56 *29·59*
„ (7). Market price	.....	...	...	...	...	...	...	...	...
„ (8). Inclusive cost of dilute acid and of by-product ammonia for neutralisation. Cost of ammonia as under Arc process (Col. 8).	Based on "lowest possible" market price.	...	...	...	...	75·98 *16·88*	...	44·02 *6·89*	... ...
	Based on war conditions, market price in 1916.	...	...	...	...	132·84 *29·52*	...	110·87 *17·31*	... ...
BY-PRODUCT AMMONIA:									
Col. (1). Market price. Cost of *crude* liquor based on price of sulphate with allowance for added *market value* of pure ammonia spirit.	Based on pre-war (average 1911-13) market price.	61·59 *50·74*	66·10 *13·61*	...	76·19 *16·93*	89·72 *19·94*	95·31 *12·39*	96·50 *15·05*	74·72 *26·15*
„ (2). Market price....	.....	...	...	...	...	...	...	...	...
„ (4), (5), (6), (7), (8). Via ammonia oxidation process cost of *crude* liquor as in (1), with allowance for *cost* of purification. (Section II.) In the case of synthetic sodium nitrate (Col. 7), soda ash is taken at £3 per metric ton.	Based on lowest known market price (1897).	32·40 *26·69*	35·84 *7·38*	...	42·12 *9·36*	54·63 *12·14*	60·45 *7·86*	61·60 *9·61*	41·55 *14·54*
ARC PROCESS:									
Col. (6), (7), (8). Inclusive of cost of producing dilute nitric acid. In the case of synthetic sodium nitrate (Col. 7), soda ash is taken at £3 per metric ton.	With power (steam generated) at £3·75 per kilowatt-year.	...	...	...	42·80 *9·51*	51·80 *11·51*	58·83 *7·65*	60·31 *9·41*	57·18 *20·01*
	With power at £3 per kw.-year	...	...	...	36·50 *8·11*	45·50 *10·11*	52·37 *6·81*	53·84 *8·40*	53·95 *18·88*
„ (8). Cost of by-product ammonia used for neutralisation based on market price of sulphate (average 1911-13) with allowance for *cost* of purifying concentrated ammonia liquor.	With water-power at £2 per kw.-year.	...	...	...	28·08 *6·24*	37·08 *8·24*	43·76 *5·69*	45·22 *7·05*	49·63 *17·37*
	With water power at £1·2 per kw.-year.	...	...	...	21·35 *4·74*	30·35 *6·74*	36·86 *4·79*	38·32 *5·98*	46·18 *16·16*
CYANAMIDE PROCESS:									
Col. (1), (2). Inclusive of cost of carbide-cyanamide stages.	With power (steam generated) at £3·75 per kw.-year.	29·36 *24·18*	38·01 *7·83*	24·04 *4·69*	41·62 *9·25*	54·12 *12·03*	59·92 *7·79*	61·09 *9·53*	41·09 *14·38*
„ (3). Raw cyanamide, unpacked and exclusive of cost of after-treatment	With power at £3 per kw.-year	27·79 *22·89*	36·44 *7·50*	22·56 *4·40*	39·91 *8·87*	52·36 *11·63*	58·15 *7·56*	59·34 *9·26*	39·40 *13·79*
„ (4), (5), (6), (7), (8). Via ammonia oxidation process, including cost of carbide, cyanamide, and ammonia stages. In the case of synthetic sodium nitrate (Col. 7), soda ash is taken at £3 per metric ton	With water power at £2 per kw.-year.	25·71 *21·18*	34·36 *7·07*	20·59 *4·01*	37·57 *8·35*	49·95 *11·10*	55·77 *7·25*	56·94 *8·88*	37·13 *12·99*
	With water power at £1·2 per kw.-year.	24·03 *19·79*	32·68 *6·73*	19·01 *3·71*	35·73 *7·94*	48·05 *10·68*	53·92 *7·01*	55·05 *8·59*	35·34 *12·37*
HABER PROCESS:									
Cols. (4), (5), (6), (7), (8). Via ammonia oxidation process. In the case of synthetic sodium nitrate (Col. 7), soda ash is taken at £3 per metric ton.	"Probable"	20·64 *17·00*	29·29 *6·03*	...	31·95 *7·10*	44·15 *9·81*	50·00 *6·50*	51·18 *7·98*	31·66 *11·08*
	Tentative	18·90 *15·57*	27·55 *5·67*	...	30·01 *6·67*	42·16 *9·37*	48·08 *6·25*	49·19 *7·67*	29·77 *10·42*

for the producer, although it would provide for interest at the rate of 5 per cent. upon capital invested in Chile.

The average market price of nitrate in this country before the war was £10 13s. 9d. All the evidence points to the fact that the production costs under post-war conditions will be higher than under pre-war conditions, and definite opinions to that effect have been expressed by competent authorities. The export duty is now heavier than formerly owing to the rates of exchange, and the cost of fuel and labour in Chile is increasing; shipping rates are also likely to remain higher under post-war conditions. In spite of countervailing factors, such as probable reduction in the cost due to more efficient methods of extraction and the possibility of a reduction in the duty and property charges made by the Chilean Government, the Committee hold that it is improbable, except in the case of very severe competition, that Chilean nitrate will be marketed in Europe at a price approaching the lowest possible indicated above.

The Committee remark that the supremacy of the Chilean nitrate industry is already being challenged on account of war developments, and the near future holds out the prospect that the market price of ammonium sulphate or of synthetic products may govern that of Chilean nitrate instead of following it as hitherto.

Increased Demand for Fertilisers

As the fertiliser market constituted by far the most important outlet for nitrogen products before the war, the Committee have devoted considerable attention to an examination of the probable post-war demand for fixed nitrogen in agriculture in the United Kingdom. The demand for artificial nitrogenous fertilisers at the present time is already more than double the pre-war demand, and this development has been favoured by the price of sulphate of ammonia, which was controlled in the latter part of 1916, and has recently been freed. From a general consideration of the prospects under the new agricultural policy they estimate that the future consumption of artificial nitrogenous fertilisers might amount to the equivalent of about 500,000 tons of sulphate of ammonia, or 100,000 tons of fixed nitrogen as compared with an existing demand for 60,000 tons and a pre-war consumption of only 25,000 tons, of which ammonium sulphate and Chile nitrate accounted for about 12,000 each, the remaining 1,000 tons being in the form of cyanamide and nitrate of lime.

The Committee have been informed by the Food Production Department that the sales of sulphate during the season June, 1917, to May, 1918, amounted to about 233,000 tons, and that a further 60,000 tons could have been disposed of had it been forthcoming. It was considered by the Department that for the season 1918 to 1919 a supply of nitrogenous fertilisers equivalent to from 300,000 to 320,000 tons of sulphate would be needed to maintain the existing rates of manuring the crops of the United Kingdom; the quantity actually available, however, might fall short of these figures by from 50,000 to 60,000 tons.

Low Production Cost of Synthetic Fertilisers

Noting that the market price of a ton of combined nitrogen in the United Kingdom before the war varied from about £66 to £67 (in the forms of sulphate and Chile nitrate respectively) and that the lowest recorded price (in the form of sulphate) was £35 16s. in 1897, the Committee state that the synthetic processes can produce the same quantity ready for the fertiliser market as "nitrolim" or sulphate, at a factory cost of from £20 to £30, that is about, or even less than, one-half of the pre-war market price in the United Kingdom. With regard to nitrate fertilisers the Chilean industry will probably be able to hold the market against the synthetic processes, but this position may be altered by the development of more economical methods of recovering oxides of nitrogen in the form of nitrate salts. Though there will probably be ample scope in the post-war market for both synthetic and non-synthetic nitrogenous fertilisers, producers may eventually have to face a competitive price of about £7 to £8 per ton for sulphate, and about £6 to £7 per ton for cyanamide, and the Chile nitrate industry, in order to hold the market against the synthetic processes, may be faced with the necessity of making substantial reductions in price, perhaps, to a figure of £8 per ton or even less.

In a summary, the Committee point out that when account is taken of the relative areas under cultivation in the food-producing countries of the world, of the pre-war consumption of nitrogenous fertilisers in the most progressive of the agricultural countries and of the corresponding consumption in the remaining countries, it is abundantly clear that the quantities of nitrogenous manures employed were in many cases below the most advantageous or profitable level. In the opinion of the Committee, which is supported by much evidence, the provision of a really cheap supply of fixed nitrogen, say, at £40 to £45 per metric ton, or 8s. to 9s. per unit—and the figures given in the report show that this should be possible even under post-war conditions—would lead to a greatly extended consumption of combined nitrogen and to an even greater rate of increase in the demand than formerly.

British Research

Research work yielding highly important results has been carried out by technical officers of the Munitions Inventions Department. Unfortunately only the barest outline of the work accomplished and the results achieved is given in the report.

Attention was first directed to the details of the Haber process. A thorough study of the whole problem of catalysis, on which the success of this process largely depends, has been made, over 200 preparations being investigated under varying conditions of temperature, pressure, and gas velocity. Those giving a high yield of ammonia with freedom from "poisoning" have been determined. Although up to the time of the experiments the highest yields quoted in technical literature were equivalent to from 0.25 kg. to 1 kg. of ammonia per hour per litre of space occupied by the catalyst in the apparatus, good catalytic substances were found which, with a high velocity of circulation of the gases, gave yields of from 10 kg. to 20 kg. of ammonia (*i.e.*, up to 80 times the published best per hour per litre of catalyst space working at pressures ranging from 100 to 150 atmospheres). A plant was constructed having a catalyst space about 600 times the size of that in the original apparatus, and high yields of the order previously indicated were consistently realised with it. These yields are far in excess of anything that is known to have been attained previously, even in Germany.

Preparations were in progress for constructing a full-sized commercial unit when the Goverment decided, at the instance of the Explosives Supply Department, to erect a national factory for the production of nitrate of ammonia by the conjoint use of this process and the oxidation of ammonia. The Committee recommend that this factory, which was in course of erection at Billingham, near Stockton-on-Tees, and on which work was suspended at the time of the Armistice, should be completed and used, if their recommendation in regard to the establishment of this process is adopted, and such a course is practicable. This factory, however, was advertised for sale a few weeks ago, and we understand that negotiations are now practically concluded for the transfer of this factory to private interests.

Hydrogen

The enormous scale on which hydrogen is now employed for the hydrogenation of fats and oils, in the manufacture of margarine and of soaps, as well as for aeronautics, makes the work accomplished on the hydrogen problem of the first importance.

Research on the synthesis of ammonia pointed to the conclusion that ultimate commercial success on the lines being developed would involve the use of hydrogen containing probably a maximum of 0.05 per cent. of carbon monoxide and less than one part of sulphur compounds in a million of gas—a purer hydrogen than had hitherto been produced in this country. Moreover, it was essential that it should be produced in very large quantities at a very low cost. Various tests with commercial hydrogen were made in the solution of this problem, and highly satisfactory results were secured, the purified gas obtained in one case during trials of several weeks' duration showing consistently less than 0.05 per cent. of carbon monoxide. A recorder for showing small percentages of carbon monoxide in hydrogen was devised, and a number of instruments have been made and operated under commercial conditions.

The Committee have come to the conclusion that the water-gas catalytic process is the most promising of existing methods for obtaining a cheap and pure hydrogen. Although the process was invented in this country, its commercial development was effected in Germany, and as far as is known to them the process has not hitherto been used on a technical scale outside Germany. Manufactured on a large scale, the cost of the gas delivered under compression to the catalyst section of the ammonia plant should not exceed 2s. 6d. per 1,000 cubic ft.

THE OXIDATION OF AMMONIA

Before the war the retort (Chile nitrate) process and the arc process were the only fully established methods of producing nitric acid. The oxidation process for converting ammonia into nitric acid, therefore, opens up a further important source of supply. In Germany the process has attained to a position of vital importance, and constituted practically the only method of obtaining nitric acid for military requirements after the cessation of imports of Chile nitrate and the exhaustion of her home stocks of that product.

The research covers an investigation into the most suitable catalytic material for the combustion of gaseous ammonia with air or oxygen; the design of converters suitable for technical use and their efficiency, output and general behaviour

Capital Expenditure for Operating Nitrogen Fixation and Recovery Processes

(Exclusive of Royalties and Like Payments)

£ per metric Ton of Combined Nitrogen per Annum in Form Specified

Initial Process or Product (with Explanatory Notes).		1. Pure ammonia as liquor.	2. Ammonium sulphate.	3. Calcium cyanamide.	4. Nitric acid. (dilute).	5. Nitric acid (concentrated).	6. Lime nitrate.	7. Sodium nitrate.	8. Ammonium nitrate.
BY-PRODUCT AMMONIA:									
Col. (1). Plant for concentrating and/or purifying	Utilising *crude* gas-works liquor.	14·57	...	...	38·70	53·30	61·25	...	33·63
,, (2). Plant for fixing pure strong ammonia with sulphuric acid section	.....	...	14·63	...	...	...	...	...	...
,, (4), (5). As in (1) with ammonia oxidation plant	Utilising *concentrated* gas liquor.	9·71	...	...	33·30	47·80	55·85	...	28·50
,, (6), (8). As in (4) with nitrate section.	.....	...	...	...	...	...	...	...	...
HABER PROCESS									
Col. (1). Ammonia factory, including hydrogen and nitrogen sections.	.....	...	...	...	...	...	...	...	...
,, (2). As in (1) with fixing plant, including sulphuric acid section.	.....	...	...	...	...	...	...	...	...
,, (4), (5). As in (1), with ammonia oxidation section.	"Probable" cost.	48·56	63·19	...	76·50	92·29	99·05	...	69·53
,, (6), (8). As in (4), with nitrate section.	.....	...	...	...	...	...	...	...	...
CYANAMIDE PROCESS (*Continuous*):									
Col. (1). Complete with carbide-cyanamide, ammonia conversion and steam power sections.	.....	...	...	...	...	...	...	...	...
,, (2). As in (1) with fixing plant, including sulphuric acid section.	Chemical section only.	32·63	47·26	25·25	58·78	74·03	81·33	...	52·70
,, (3). Complete with carbide-cyanamide and steam power sections.	Steam power section only £10·26 per kilowatt demanded.	21·40	21·40	20·20	23·80	24·52	23·80	...	22·60
,, (4), (5). As in (1), with ammonia oxidation section.	.....	...	...	...	...	...	...	...	...
,, (6), (8). As in (4) with nitrate section.	.....	...	...	...	...	...	...	...	...
	Total ...	54·03	68·66	45·45	82·58	98·55	105·13	...	75·30
ARC PROCESS:									
Col. (6), (8). As in (4) with nitrate section	.....	...	...	...	...	...	...	...	...
,, (8). With addition of plant for preparing pure ammonia from *concentrated* gas liquor.	Chemical section only.	...	...	...	69·75	92·25	92·30	...	46·73
	Steam power section only at £10·26 per kilowatt demanded.	...	...	...	86·29	86·29	86·29	...	43·14
	Total ...	...	...	...	156·04	178·54	178·59	...	89·87
CHILE NITRATE:									
Col. (7). Factory and nitrate grounds in Chile, including shipping for marketing product in Europe.	Factory in United Kingdom.	...	...	...	...	27·67	...	...	25·69
,, (8). Nitric acid factory in United Kingdom with sulphuric acid section and plant for preparing pure ammonia from *concentrated* gas liquor.	Factory and nitrate grounds in Chile, including shipping for marketing.	...	...	...	...	104·93	...	94·31	...
	Total ...	...	...	...	...	132·60	...	94·31	25·69

under widely differing conditions; the reaction kinetics of the oxidation process as a whole, including the absorption of oxides of nitrogen by water in tower systems and the production of strong nitric acid; the absorption of oxides of nitrogen by solvents other than water; the preparation of nitrates from oxides of nitrogen by dry and wet absorption processes; and the direct preparation of nitrate of ammonia from oxides of nitrogen.

Double-net converters of simple design were eventually evolved which, under favourable conditions, gave an efficiency of 98 per cent., the mean efficiency over a wide range of experiments under varying conditions and during continuous runs being above 90 per cent. At the maximum rate of gas flow the output of the apparatus was very high, amounting to 1½ metric tons of nitric acid (100 per cent.) per square foot of double-net per 24 hours, which is much in excess of the output of any converter hitherto known.

The results achieved were put into practical operation at once, and converters designed by the research staff have been installed in various British chemical works for the production of the oxides of nitrogen required in the manufacture of chamber sulphuric acid, and are said to be giving satisfactory results. Before the war the annual consumption of Chile nitrate for this purpose alone was 18,000 tons; with the present increased output of sulphuric acid the consumption is greater, so that the possible saving of overseas freight is considerable.

With regard to further research it is recommended that a thorough trial should be given to a modified form of the Häusser process, by which nitric acid and power can be obtained simultaneously, and that cyanide processes should also be investigated, particularly in relation to the possibility of internal electrical heating and of devising a continuous process for the production of ammonia.

With the prospect of the increasing competition of pure synthetic sulphate it is clear, the Committee say, that serious efforts must be made to market a purer by-product sulphate than formerly. The main drawback to sulphate has been its acidity. If cheap sulphuric acid should not be available in the future a solution of the problem of the cost of fixing ammonia must be sought in methods which avoid the use of that acid. The Committee mention a number of these, and recommend that their possibilities should be investigated on a commercial scale, and encouragement and assistance given to companies and undertakings willing to carry out trials for the benefit of the by-product ammonia industries as a whole.

By-product Recovery Schemes

The technical and financial aspects of by-product recovery power schemes are examined in great detail, and the view is taken that large by-product power schemes will have to receive the support of the Government or be carried out entirely as national projects. It is contended that, on account of the value of the by-products to the country, this course would be justifiable so long as the advantages of direct coal firing were not sacrificed to any substantial extent for the purpose of conserving products which could be obtained more economically by other methods.

As compared with direct coal firing, all by-product schemes involve a larger consumption of coal (from 32 up to 150 per cent., according to the method employed), a larger capital outlay, and higher operation costs. The national aspects of increased coal consumption are discussed, and the conclusion is reached that if it were ultimately found practicable to adapt by-products schemes to power production on a large scale, the economies in coal consumption consequent on the centralisation of power supply would more than counterbalance the percentage increases referred to.

Contrary to all previously expressed expert opinion it is the view of the Committee that in the present state of our knowledge, the application of by-product recovery processes to power production on a large scale offers no immediate prospect of reducing the cost of electrical energy from coal below the figures attainable by direct coal firing and the use of large steam turbo-electric units. Moreover, the employment of any of the well-established methods of treating coal for by-product recovery—high temperature carbonisation (gas works practice or coke oven practice) or the complete gasification of coal in existing types of recovery producers—offers little or no prospect of competing upon a commercial basis with direct coal firing.

Oxygen Prices

As oxygen and the rare gases argon, neon and helium constitute valuable by-products in certain nitrogen fixation processes they receive attention in the report. Disclosures are made concerning the cost of oxygen, for which there has been a great demand during the war for engineering, medical and aviation purposes. Before the war it appears that the selling price of oxygen to fairly large users was 1d. per cubic foot, or, say, £4 per 1,000 cubic ft. inclusive of the cost of compression into cylinders, of the hire of the latter, and of freight, the total of which is small. Yet the cost of production of practically pure oxygen is stated to be in the neighbourhood of 10d. to 1s. per 1,000 cubic ft.

The Committee state that the oxygen and liquid air industries in this country cannot be said to have enjoyed a free and unrestricted development on a competitive basis, and that the prices hitherto prevailing for the compressed and liquid products have not been conducive to their employment to the fullest extent in the important directions mentioned, and have served to debar their use in other industries in which cheap and, perhaps, low-grade oxygen might have been utilised with advantage. They recommend that "all liquid air nitrogen plants used in connection with nitrogen fixation installations in the United Kingdom should be operated to the maximum advantage for supplying the growing home demand for oxygen and argon," and that "the imposition of restrictive trade agreements—such as have been operative at nitrogen fixation installations abroad—which prevent the recovery and utilisation of by-product oxygen from nitrogen plants, should not be permitted in this country."

Synthetic Ammonia

Georges Claude Process Rights Acquired

THE rights of the new French Georges Claude synthetic ammonia process have been secured for the United Kingdom, South Africa, India, Australia, and New Zealand by Cumberland Coal, Power and Chemicals, Ltd., of which Mr. A. E. Barton is chairman, and with whom are associated a powerful and influential British financial group, who intend erecting extensive works in Cumberland as quickly as possible to produce on a large scale synthetic ammonia for the production of fertilisers, nitric acid and other chemical products from ammonia.

This announcement is of peculiar interest (*The Times* states), coming as it does immediately after the issue of the report of the Nitrogen Products Committee. It is claimed that the new French process has enormous advantages over the German Haber process, and that, in fact, it represents the greatest development ever known in connection with nitrogenous products. The improved synthetic ammonia process, which has been developed by M. Georges Claude at the works of the Grande Paroisse, Montereau, near Fontainebleau, differs essentially from the development given to the original Haber process by the Badische Anilin u Soda Fabrik at Oppau, near Ludwigshaven, by aiming at increasing instead of diminishing the pressure at which the mixture of nitrogen and hydrogen are constrained to enter into combination to produce ammonia. Both in Germany and in the United States the tendency has been to endeavour to bring about their combination at lower pressures rather than at higher pressures. The German original working pressure was some 300 atmospheres and this has been reduced in present practice to some 200 atmospheres, while in the United States the Degendre, or General Chemical Company's modified Haber process, has further reduced the pressure of combination to about 150 atmospheres.

The French process, which is based on original patents obtained by M. Georges Claude entirely independent of those upon which the Badische Company rely, increases the pressure of combination to 1,000 atmospheres (14,000 lb. to the square inch) without reducing the temperature at which the combination is effected. By increasing the pressure of reaction to 1,000 atmospheres the yield of ammonia is increased fourfold up to 50 per cent., while the speed of reaction is commensurately increased. The power required to compress to 1,000 atmospheres is admittedly greater than to 200 atmospheres, but there are some essential advantages secured which, in the final result, makes the total power expended per ton of synthetic ammonia produced no larger than what is required for compression at 200 atmospheres. The plant and process have been examined by a number of British experts, who have expressed themselves as highly satisfied with the achievement of M. Georges Claude.

West Cumberland, it is understood, has been chosen as the site of the proposed new works, as the district offers the greatest advantages for large chemical undertakings. Cumberland coke is described as the richest in hydrogen, and there are the further advantages of proximity to the seaboard and an ample water supply for cooling and condensation purposes.

Colloidal Clay in Soap Manufacture

To the Editor of THE CHEMICAL AGE.

SIR,—The idea of using china-clay as a filler in soap and paper manufacture is, of course, not new, and the part played by a fatty-acid salt, soap proper, in washing, is not by any means obscure. When you wash yourself with soap (and water) the purifying action depends upon the fact that it is decomposed by a large quantity of water into free alkali and an insoluble acid salt. The first of these takes away the fatty dirt on washing, say, the hands or face, and the latter forms the soap lather, which envelops the greasy matter, and thus tends to remove it. This is the usual way a soap maker would describe it. And as an early example of soap we have wood ashes and tallow boiled with quicklime and water. Further, hot solutions of all true soaps form jellies—when cooled. But china clay, though very useful, perhaps, as an adulterant substitute for fat, if you like, is not of the same family, either chemically or physically, and we must not expect therefore too much of it as a "colloid" or otherwise—in soap!—Yours, &c.,

JAMES C. RICHARDSON.

2, Aliwal Road, S.W., January 20.

To the Editor of THE CHEMICAL AGE.

SIR,—Your announcement in reference to Mr. F. E. Weston's experiment as to the use of clay in soap manufacture interests us much. You and Mr. Weston appear to be under the impression that this discovery is some new thing. We would inform you that we have manufactured a soap from clay, and have sold very large quantities during the last two years.—Yours, &c.,

61, Mark Lane, E.C. 3. WILLIAM PEARSON, LTD.
January 17.

[In reply to our correspondents we may point out that we made no claim that the use of clay as an "adulterant" in soap manufacture is by any means new. It was stated that by specially treating certain forms of clay by means of Mr. Weston's patented process the prepared clay would form, not a "filling" but an actual substitute for soap material. We might mention that Mr. Weston has consented to deal in our columns with all questions which may arise out of the correspondence on the subject. —ED. *C.A.*]

A New Instrument for Measuring Vapour Tension

To the Editor of THE CHEMICAL AGE.

SIR,—I was much interested in the account of "A New Instrument for Measuring Vapour Tension," described by Mr. H. Moore, M.Sc., to the Manchester Section of the Society of Chemical Industry, as I have been working on vapour pressure measurements for some time.

The apparatus described by Mr. Moore is almost identical in form and principle with an apparatus which I devised and made in 1910 in the laboratory of Messrs. Philip Harris & Co., Ltd., Birmingham. The apparatus as described by Mr. Moore does not obtain all the advantages secured by my own form, which eliminates the difficulties mentioned in the discussion of Mr. Moore's Paper. I submitted my apparatus to the late Prof. J. H. Poynting, Sc.D., F.R.S., of Birmingham University, who expressed the opinion that it was the best for the purpose which he had seen. I have lately improved the apparatus and extended its application to scientific use.

As the application of vapour pressure measurements appears from Mr. Moore's work likely to be adopted by chemists to obtain indications not obtainable by the distillation and usual chemical tests, I should be prepared to give an account of my apparatus if any of your readers considered it would be desirable.

A convenient and very successful method for measuring vapour pressures of volatile liquids has been described by Menzies in the *Journal* of the American Chemical Society (32, 1910, p. 1615), and the attention of chemists might be drawn to this Paper, which summarises the inherent difficulties of the methods and the common sources of error, which have accounted for the discrepancies in the work of various experimenters.—Yours, &c.,

The Rutlish School, Merton, S.W. A. V. C. FENBY.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIALS.	REF. NO.
Morocco	Window Glass	88
Canada (Saskatoon)	Boot Polishes	63
Mexico	Industrial Chemicals...	119
Dominican Republic (San Domingo)	Chemical Products	118
Italy (Milan) ...	Caustic Soda, Solway Soda and Bichromate of Potassium	108
Belgium (Antwerp)	Drugs, Chemicals, Oils, &c. ...	99

The *Board of Trade Journal* states that a translation of a complete list of articles in which foreign competition will be admitted in connection with the Spanish Government Contracts during 1920 may be consulted by British firms on application to the Latin-America Section of the Department of Overseas Trade. The list is divided into sections, which include metallurgical products, scientific material for instruction and research purposes, and chemical products.

International Research Council

THE International Research Council has been constituted, by successive meetings in London, Paris, and Brussels, as a Federation of National Research Unions. Under its auspices, *Nature* states, unions are being formed for the organisation of international work and co-operation in different departments of science, the unions already instituted being for astronomy, geodesy and geo-physics, mathematics, and (provisionally) chemistry and biology. The question of international organisation in science is raised, to a great extent, by Article 282 of the Peace Treaty, which states that "treaties, conventions, and agreements of an economic and technical character not included in a specified list cease to be operative." That this article was intended to cover conventions on scientific matters appears from the list of exceptions, in which the Metric Convention and the International Agricultural Institute at Rome are included. With the view of obtaining the opinion of representatives of pure and applied science upon the subject of the co-ordination of international effort and action, a special meeting of the Conjoint Board of Scientific Societies was held at the Royal Society on January 8. After much discussion the following resolutions were passed: "(1) That the executive committee be requested to appoint committees for the purpose of considering the desirability of forming in branches of science, as recommended by the Brussels Conference, international unions connected with the International Research Council, or of joining such Unions if formed independently. (2) That these committees be authorised to make recommendations with regard to the proposed statutes and the constitution of national research councils. (3) That the committees consist of representatives nominated by the principal societies concerned, together with additional members nominated by the executive committee."

Books Received

TRANSACTIONS OF THE MINING INSTITUTE OF SCOTLAND. General Meeting at Edinburgh, October 18, 1919. Vol. XLI. Part 3. Pp. 28.

PROCEEDINGS OF THE PHYSICAL SOCIETY OF LONDON. Vol. XXXII. Part 1. Fleetway Press. Pp. 55. To non-members, 4s. net.

THE MANUFACTURE OF INTERMEDIATE PRODUCTS FOR DYES. Second edition. By John Cannell, Cam. D.Sc. Macmillan & Co., Ltd., London. Pp. 273. 10s. net.

IN VIEW OF THE SHORTAGE of coal the French Government recently voted a credit of 1,000,000 francs for oil-prospecting projects. A message from Reuter, dated January 8, states that in Auvergne district at Martres d'Artieres, at the foot of the Domes chain, a powerful geyser has spouted out of one of the borings, and a column of warm and very salt water is now ascending to a height of 120 ft., giving a volume of 18 gallons per second, while a considerable amount of carbonic acid is also produced. The presence of rock salt in the water is stated to indicate that an oil seam is very close.

British Chemical Manufacturers

Proposed Chemical Industry Continuation School

A MEETING was recently held at the offices of the Association of British Chemical Manufacturers, 166, Piccadilly, London, W. 1, at which Mr. W. J. U. Woolcock, M.P., occupied the chair, for the purpose of discussing with Sir Robert Blair, the chief education officer of the London County Council, a scheme for compulsory day continuation schools under the Education Act, 1919.

Sir Robert Blair explained the conditions under which the Education Department of the London County Council deemed it advisable for the contemplated action to be taken. Hitherto, he said, boys and girls having left the elementary school were free to do as they wished; some 20 per cent. would attend evening schools, whilst 80 per cent. would do nothing with their time, and probably drift into blind-alley occupations. Compulsory education, therefore, appeared to be essential if boys and girls were to follow useful occupations. The Act required that after a given day boys and girls who arrive at 14 years of age should attend compulsory day continuation schools for eight hours a week for 40 weeks in the year. The compulsion applied to boys and girls who reached the age of 14 after the appointed day—which would probably be some time next autumn—and not to any who were 14 on or prior to that day. The obligation was to apply at first only to boys and girls between 14 and 16, and seven years from the appointed day would apply to those between 16 and 18.

In view of the fact that boys and girls may live in one district and work in another, the problem of arranging the hours for attendance at these schools is very difficult, but Sir Robert Blair finally suggested that two days of four hours each—either morning or afternoon—would be the best solution. The opinion of those present was that this method should be adopted. There is also an obligation on the part of the employer to allow sufficient time for the boy or girl to reach the school and to be in a fit physical condition to assimilate their lessons.

Chemical Industry School

As regards the chemical industry, Sir Robert Blair suggested it might be advisable to establish a chemical school where the pupils could not only take general education, but also receive tuition in chemistry. It is, therefore, necessary to ascertain the number of boys and girls of the suitable age engaged in the chemical industry in London, and he asked the meeting to endeavour to supply this information. If such pupils reside in the London area the obligation rests on the London County Council. If they reside outside this area and work in London, the obligation rests on the authority in whose area the pupil resides. The question of establishing special schools for boys and girls engaged in any particular industry will, therefore, need careful consideration.

Sir Robert put a question as to whether the chemical industry was seasonal—wholly or partly—and the meeting gave the following information.: —

TAR DISTILLERS, PHARMACEUTICAL AND FINE CHEMICAL BRANCH.

No season, busy all year round.

GAS COMPANIES.

Seasonal; winter the heaviest time.

FERTILISERS.

Seasonal; autumn, winter, spring, busy; summer, slack.

It appears that there are 60,000 children leaving the London elementary schools yearly. Provision will have to be made in these compulsory continuation schools for 240,000 pupils when the Act comes into force. The problem of accommodation and the provision of teachers will therefore give considerable trouble to the responsible authorities.

The next question was that of the curriculum. In many schools this will be of a general character, but where pupils are engaged in specialised trades instruction in the technicalities of such trades will be introduced.

Sir Robert then suggested that where a firm had a sufficient number of boys and girls of the proper age on their staff the question of providing a schoolroom on their premises should be considered, and if the firm also had on their staff adults capable of giving the requisite teaching this would obviate the necessity of boys and girls attending separate compulsory continuation day schools. He also stated that the "appointed day" would probably be July 31 or October 31, as already indicated in the Act. Boys and girls would not therefore leave on the day they attained the age of 14, but at the end of the term in which they reached that age. This will mean that approximately 15,000 will leave the elementary schools at the end of each term. He further stated that it was most important to consider whether these boys and girls should be exempt from continuation schools by attending full-time schools. In response to various questions Sir Robert said that secondary and central schools would be most suitable for full-time education. Employers appear to have the right to refuse to employ children under the age of 16. A private works school would be recognised by the authorities, provided the curriculum and the number of pupils satisfied the local education authority. It was hoped that the appointed day would be the same for Greater London and for other local authorities.

The Chairman referred to the question of the number of boys and girls employed in chemical factories in the London area, and the opinion of those present was that approximately 15 per cent. of the total number of employees would be boys and girls between 14 and 18 years of age, based on the Home Office figures of 20,000. It was, therefore, estimated that provision would have to be made for 3,000 pupils engaged in the chemical industry in the London area.

So far as gas companies are concerned, it was stated that the percentage was about 10 to 12 per cent.

Referring to the question of the curriculum, Sir Robert Blair made the following statement: "In the first two years physical education must be taken; one of the special provisions under the Act is that physical education is necessary. Then for general subjects there would be writing, English, some English literature, history and geography. That would be for boys from 14 to 16; then later, for boys 16 to 18, more technical subjects would be taken, mathematics, science, and for boys going into different trades a subject fitting to those trades, such as rates of exchange for insurance and banking and accounts for commercial offices, and so on."

Society of Chemical Industry

Papers Before the Edinburgh Section

AN informal meeting of the Edinburgh Section of the Society of Chemical Industry was held in the Cockburn Hotel, Edinburgh, on Tuesday, January 13, Dr. Jordan presiding.

Solubility of Nitro-Cellulose in Methyl Alcohol

Mr. B. D. W. Luff read a Paper on "The Solubility of Nitro-Cellulose in Methyl Alcohol." In describing the different forms of nitro-cellulose he said the product could be obtained with very widely varying properties in which the nitrogen content might vary from 10 to 13 per cent. The material might also be soluble in a variety of solvents; or quite insoluble in any solvent. Both the insoluble and the soluble varieties were used in the manufacture of explosives; but for the peaceful arts the soluble variety was the one almost entirely used. There was very little information in its literature. It was a matter of general experience that such things as acetone, amyl acetate and other solvents could be used, but it was very curious that ethyl ether or ethyl alcohol were by themselves non-solvents, but mixed together in certain proportions solution could be obtained. Commercial methyl alcohol was very frequently used as a solvent in the preparation of varnishes. He had always thought that methyl alcohol was a solvent of nitro-cellulose, but in a very comprehensive compilation by Warden—a standard book—it was stated that pure methyl alcohol was a non-solvent of industrial nitro-cellulose. In order to prove this statement Mr. Luff had obtained some pure methyl alcohol. It was labelled pure, but he found it gave a distinct reaction of iodoform. Warden himself said that the solvent action of methyl alcohol was entirely due to the presence of acetone. The alleged pure methyl alcohol was treated with iodine and caustic soda and then distilled. A product was obtained which gave no indication of iodoform reaction. This alcohol gave quite a clear solution. Another sample of pure methyl alcohol was obtained from pure methyl oxalate. It was interesting to see how much acetone would be necessary to make a non-solvent capable of dissolving a substance. He had tried the effect of adding varying quantities of acetone to ethyl alcohol which, by itself, is a non-solvent of nitro-cellulose. A mixture containing 5 per cent. of acetone and 95 per cent. of ethyl alcohol was found to have very little solvent action on nitro-cellulose: it required a mixture containing 10 per cent. of acetone to impart a solvent effect on the ethyl alcohol. These results were interesting because they were another indication that the first member of a homologous series might behave differently from the others. He thought they would agree that methyl alcohol was quite a good solvent.

Mr. Luff showed a number of tubes to demonstrate the various points mentioned.

Mr. J. R. Hill remarked that collodion was used for surgical purposes, the solvent used being a mixture of ethyl alcohol and ether, which was a rather expensive medium. A cheaper kind had been prepared by the use of acetone. Mr. Luff's information with regard to the solubility of nitro-cellulose in methyl alcohol suggested the possibility of a fairly cheap collodion prepared by the use of pure methyl alcohol. As far as he was concerned, that was quite new information and a valuable suggestion from the pharmaceutical point of view.

Mr. G. F. Merson, speaking from the manufacturing side as to the relative cheapness of methyl and ethyl alcohols, said the duty was an additional difficulty at present. There was a very substantial duty on methyl, as well as on ethyl alcohol. Acetone would be a much more desirable adjunct to the ethyl alcohol as a solvent and would cheapen it very much. It was hoped that industrial alcohol without the addition of rock oil would be sold all over the country. It was duty free and with methylated ether as a solvent mixture would compare favourably even with ethyl alcohol and acetone.

Dr. Cumming, Mr. Watson and the Chairman also contributed to the discussion.

Mr. Luff, replying to a question as to why the substance seemed to be much more soluble if it were dissolved and the solvent evaporated off, said it might be that the nitro-cellulose film had been submitted to a certain amount of heat. If there were no heat at all the decomposition would take place slowly. Another reason might be that although it was insoluble in the regular solvents, very often varnish might contain nitro-cellulose phenol or some solvent that might have been washed out of the benzine and be left with the film of cellulose. He further stated that certain nitro-celluloses would not dissolve until they had a drop of water present. If they had methyl absolutely free from water they were almost sure to dissolve. A small proportion would not result in insolubility. That was really the point. What he meant to show from the tubes was the effect of adding an increasing proportion of acetone to non-solvent nitro-cellulose. It required certainly more than 5 per cent. of acetone to produce any solubility. They wanted more than a trace of acetone to make solubility. It would not dissolve with only 5 per cent. of acetone present.

The Action of Halogens on Rubber

Mr. B. D. Porritt next read a "Note on the Product Formed by the Action of Halogens on Rubber." He said he thought an informal meeting was a favourable opportunity for bringing forward a few notes arising out of some samples of rubber which had been under examination in the laboratory during the past year. The average person was inclined to overlook the fact that rubber would be regarded by the chemist as a relatively unstable and unsaturated body. It was reacted upon by bromine very readily. The problem of providing a satisfactory substitute for rubber for use with chlorine gas had been a very important and difficult one during the days of trench warfare. Recently he received some samples of rubber tubing which had been subjected to such treatment. From the beginning of the rubber industry, which dated from 1840, the effect of chlorine on rubber had been fully recognised, and early workers endeavoured to convert this inevitable defect into a profitable use. There was at present no satisfactory direct method available to estimate the rubber content of a sample. It had to be done by the estimation of the other contents. Many rubber chemists had made attempts to provide a solution and the formation of the tetra-bromide had been suggested and worked out by Spence, an Aberdeen man, now in America. It appeared at first sight fairly satisfactory, but it had not received any recognition, sufficient to show it to be trustworthy.

Speaking of the technical possibilities of rubber and the perishable nature of rubber pipes when used for chlorine in gas warfare, Mr. Porritt described the patent process brought out by Peachy and the use that had been made of it in that connection. Peachy dissolved the rubber in a solvent, such as carbon tetra chloride, and then saturated the solution with chlorine; this product was now on the market under the name of decroprene. Used as a paint it left a film on the substance painted which was strongly resistant to moisture, alkalis and acids. The author recently found among the works of Bridgeman a specification published by the Patent Office and was struck by the marked similarity which two early patents had to that taken out by Peachy in 1915. The dates of these patents were 1859, one of which came from America and the other presumably from Germany. This composition was soluble in all the usual solvents of rubber, but water or acid had no influence on it. Being hard and of a light colour it could be used in many ways. They had here an interesting example of three independent discoveries of the same substance. The first two might be regarded as having been before their time. The products described had found very little practical use and the early discovery had lain dormant for 60 years until Peachy rediscovered the process.

Major BRUCE, in the course of the discussion, said that in warfare the difficulty they had was not so much with the rubber pipes as with the joints. The chlorine did not come through the rubber pipes very much. They only used them about 18 minutes at a time, and if as soon as the gas was released they had been allowed to cool the chlorine would have evaporated, but generally the pipes had to be left in the trenches, and when they warmed up the chlorine went through them, so that as a rule they were not able to use them more than two or three times. But they were much more practical than iron ones. The Germans used lead pipes.

The discussion was carried on by Mr. Williams, Mr. Victor Ellis, Mr. Dawson and Mr. Luff, and Mr. Porritt replied.

Manufacture of Potassium Iodide

Dr. A. C. Cumming communicated a "Note on the Manufacture of Potassium Iodide," and Mr. J. R. Hill, Mr. G. F. Merson, and Mr. Watson took part in the discussion.

An Acid Sulphate of Strychnine

Dr. Lander read a manuscript communication by Dr. D. B. Dott, who was unable to be present, on "An Acid Sulphate of Strychnine." The point of the note was that there were two sulphates of strychnine—one normal and the other an acid sulphate—which contained a different amount of strychnine. By repeated extraction with water the acid salt was transformed into the normal sulphate on account of the decomposition of the salt by water. Dr. Dott thought that only the normal salt should be used because where the acid salt was used they were liable to have varying and unknown amounts of strychnine in the solution. With such a highly toxic substance as strychnine he was of opinion that it was highly dangerous to use other than exact amounts of the alkaloid.

The Chairman, in moving a vote of thanks to the contributors of Papers, remarked that their informal meetings generally proved exceedingly interesting and lead to valuable information being communicated. He intimated that at their next meeting on February 10 Professor Walker would read a Paper on "Modern Views on the Structure of the Atom."

Studies in the Composition of Coal

Papers by Dr. R. Lessing

AT the ordinary scientific meeting of the Chemical Society on Thursday, January 15, Dr. R. Lessing read Papers on "The Behaviour of the Constituents of Banded Bituminous Coal on Coking," and "The Mineral Constituents of Banded Bituminous Coal," in which he described experiments with the four main constituents of coal which had been isolated and described by Dr. Marie C. Stopes, mainly from the microscopical and palæo-botanical point of view, and designated by her Fusain, Durain, Clarain and Vitrain respectively.

Dr. Lessing said that he had investigated the behaviour of samples of these four constituents of coal obtained from a seam at Hamstead Colliery, South Staffordshire, by the following method (described in the *J.S.C.I.*, 1912). One gram of the coal sample was placed in a cylindrical silica retort of approximately ½ in. internal diameter, fitted with a side-tube 2½ in. from the bottom, and heating it in an electric furnace. A loosely-fitting piston, weighing 7·5 grams, was placed on the coal charge, compressing it slightly, whilst allowing the gases and vapours to escape freely. These were led through the side tube and a cotton wool scrubber into a eudiometer. The coal was heated in a confined space, and the carbonisation was completed in a few minutes. There was a considerable temperature gradient from the outside to the interior of the coal, at any rate during the first minute or two, which permitted the condensation of some primary products of decomposition and their interaction with coal which had not undergone any consideable thermal change. By this interaction of the partly carbonised coal with primary products and the secondary decomposition of the latter the coherent coke was formed.

The principal object of the investigation was to ascertain any distinctions exhibited by the solid coking residues of the four constituents, and the characteristic and suggestive differences found fully justified the work. The yields of liquid and gaseous products at temperatures of 600°C. and 900°C. were also determined.

Slides were exhibited to illustrate the distinctive physical characters of the coke obtained from the different specimens under varying conditions.

In the case of Fusain there was no outer change in appearance after coking, and there was no tendency to adhere. The particles retained their fibrous structure, and no difference in appearance could be observed between residues obtained at each temperature.

Durain also was found to undergo very little change of form during coking. The particles retained their angular shape, and showed little tendency to adhere to each other, although more so than in the case of Fusain. This applied particularly to the 600° series. At 900° the specimens were somewhat firmer, but it was concluded that Durain must be regarded generally as of little coking value.

With regard to Clarain, this constituent showed considerable fusion and merging of particles. At 900° most of the fine and medium-sized particles lost their identity almost completely, whilst even the coarse ones sintered or fused to rounded shapes which firmly cohered with their immediate neighbours.

With Vitrain the particles were well sintered and showed rounding of the angular edges, but the consolidation of particles was not so marked as in the case of Clarain. The coke specimens showed a mushroom formation, as was the case with Clarain, but much more definite. This phenomenon was probably closely connected with the whole problem of the carbonisation of coal and the hitherto unexplained discrepancy in the behaviour of various coals when subjected to thermal decomposition, and Dr. Lessing suggested as an explanation that the formation of coke was due to the partial or complete fusion of coal or solutions of coal in tar or pitch primarily produced from adjacent coal particles, followed by an energetic thermal decomposition of the fused or sintered mass by which its chemical constituent was altered, and further fusion was consequently arrested.

The Second Paper

In the second Paper the ash contents of the four constituents were dealt with. The samples used were not crushed or mixed, as was usual in commercial analyses, but one or more individual pieces were ignited for each test. A table was exhibited showing the results obtained.

With regard to Clarain and Vitrain it was found that the percentage of ash was fairly constant. The variation of the ash con-

tents of Durain was much more marked, although the discrepancy was not appreciably increased over that of Clarain. The percentage in the different samples of Fusain, however, varied considerably.

Turning to the analysis of the ash, the figures obtained showed very considerable differences, and illustrated the character of the mineral constituents of Vitrain, distinguishing it clearly from Durain, whilst showing similarity with Clarain.

The analysis was carried out by first separating the ashes into fractions soluble in water, soluble in HCl and insoluble in HCl. The water soluble and HCl insoluble fractions were weighed after evaporation and drying. The HCl soluble could not be weighed directly on account of the formation of chlorides and the alkalies and alkaline earths, and were determined by difference. Each of the fractions were analysed separately, but the ammonia precipitate of all three had to be combined.

The results showed that Fusain contained a high percentage of lime and soluble matter, a good deal of the former being present as calcium oxide. Nearly 75 per cent. of Durain ash was found to be insoluble in water or acid. The water soluble portion amounted to only 3·5 per cent., and consisted of calcium sulphate. Clarain was the only ash which contained considerable amounts of magnesia. The soluble portion was high, but the percentage of lime was lower than in the case of Vitrain, in which it was present as sulphate. The Vitrain ash contained the lowest percentage insoluble as well as the lowest silica of all, and the magnesia figure was low. The amount of acid insoluble in Vitrain was also small.

In conclusion, Dr. Lessing said that in view of the fact that only small samples of coal taken from the Hamstead seam alone had been used the results could not be generalised without further investigation on other coals. They were mainly recorded with a view to stimulating research.

Dr. Stopes, at whose instigation the experiments were carried out, spoke of the difficulty she had experienced in obtaining the sympathy of chemists. Two years ago she had approached an eminent chemist to take up research work in this direction, but he would not entertain the idea.

At the conclusion of the proceedings a hearty vote of thanks was accorded to both Dr. Lessing and Dr. Stopes for their valuable work.

Citric Acid from West Indian Limes

At a meeting of the Liverpool Section of the Society of Chemical Industry held at the Midland Adelphi Hotel, on Friday, January 16, Major F. E. Etherington, of Holt, Thompson & Co., Ltd., of Liverpool, read a Paper on "Limes and Some West Indian Products."

The average amount of juice expressed from the lime, the author said, was about 59 per cent. of its weight. Out of a total of 16,000 tons of citric acid in the British Isles in pre-war days, 10,000 was used imported from Germany. To replace the hand-crushing process, which was lengthy and wasteful, a machine had been invented, by means of which the yield of citric acid from 7½ to 8 gallons of juice varied from 12 oz. when the rainfall was high, and 14 oz. when it was low. Major Etherington gave the following analysis of lime and lemon juice:—

	Lemon juice.	Lime juice.
Solid matter	8·80	8·60
Sugar	2·30	9·70
Citric acid	4·57	5·60
Mineral matter	0·35	0·35
Potash	0·15	0·12
Phosphoric acid (soluble) ...	0·010	0·065

The Chilian Government are taking measures to assist the nitrate industry during the present period of depression. The maximum amount of nitrate on which Treasury loans are based is to be raised from eight to 12 million quintals.

Ernest Scott & Co., Ltd., and George Scott & Son (London), Ltd., chemical engineers, have now re-opened their Manchester offices after a temporary closure during the war period. Mr. James L. Carlyle is their representative, at 41A, Victoria Buildings, Manchester.

In addition to the recent accepted offer of the Skandinavia Insurance Co. of £1,000 to the Commercial Education Department, to be applied to 10 years prizes for proficiency in Danish, Norwegian and Swedish, Mr. C. L. Hansen, of the Danish Bacon Co., has offered annually for the next 10 years a scholarship (to be known as the "King Canute Scholarship"), providing fare to and from Denmark, with three months' board and residence and tuition in one of the Danish high schools; the Russian and English Bank, through its manager (Mr. A. Kiaer), has presented a gold, silver and bronze medal for like recipients, these to be called "The Kiaer Medals for Danish," and Messrs. Plum & Skikkild, on behalf of the Danish Butter Exportation Committee, have offered Danish books to the value of 10 guineas annually for requisite distinction in the Chamber of Commerce senior examinations for Danish.

Notes on French Chemical Industry

The importation of German chemicals has begun on a scale large enough to allow a few chemical industries to be run at a fairly normal rate of production. Doubts are expressed in certain quarters if this new state of things can last long owing to the unsettled industrial conditions in Germany, which winter is not likely to improve. No great reliance is placed on Italy either—whence France gets either directly or through England such products as aluminium salts, borax and boric acid, sulphur, sulphates, citric and tartaric acids, oils, &c.—on account of the great social unrest prevailing there, which has at its root the shortage of the most vital raw metarials. Under such circumstances, and to meet her own great wants, France will have either to find substitutes for all these intermediates or develop new processes if she is to cope with her great economic difficulties, which can only be solved by intensive production. This effort she is prepared to make, but many difficulties are in the way, for, apart from the shortage of raw materials and of intermediates, and a still disorganised railway system, there is considerable labour unrest. Another factor retarding production in the chemical industries is a lack of co-ordination between the different factories, each trying to turn out as many different products as possible, thus dispersing instead of concentrating effort. The importance of organised specialisation is better understood now, and the evident results it will have on working costs will lead to its adoption.

Alsace-Lorraine

The development of the natural resources of the recovered provinces is a favourite topic. Recent prospecting has revealed that the potash beds of Alsace can produce 300 million tons of pure potash, which represents an amount 300 times greater than the world's annual consumption before the war. The oilfields of Alsace are also eliciting great interest. They are chiefly located to the north-west of Strasbourg around Pechelbronn, extend over an area of 44,000 hectares, of which 14,000 can yield petroleum on a commercial scale, and are worked on very scientific lines. Quite recently oil was struck in a new boring on a quite virgin part of the oilfield, and this is estimated to give a daily yield of 30 tons. The current opinion on the iron-ore of Lorraine is that, although very abundant, its high phosphorus content will compel manufacturers to produce specialised goods, such as rails, joists, and section iron. Coal supply will be a great difficulty owing to the remoteness of the sources of fuel—North of France, Belgium and Germany. Another drawback will be the shortage of labour, and recourse will have to be had to foreign workers.

Coal and Transport

Production is improving in a very noticeable manner in the coalfields. The official figures for September amount to 1,687,000 tons, to which must be added 151,000 tons from the coalfields of Lorraine. The production for November—Lorraine excluded—will probably exceed 1,800,000 tons. Labour is abundant and especially so on the coalfields of the Central Plateau, where the rate of raising coal has doubled. Prospecting is rife all over France with a view to locating extensions of the different coalfields. This policy is dictated by the fears which the recent strikes in England and the United States have inspired. The various railway lines are being restored with great speed. On the Northern railways practically all the stations are now open to traffic. On the Eastern railways abundant snowfalls in November had a retarding effect, but work is progressing very favourably. On December 1 less than 100 km. out of the 367 km. of canals and waterways which at the time of the armistice were unnavigable remained to be open to navigation again.

Colonies

Great interest is shown in the development of the graphite beds of Madagascar, which are reckoned to be superior in value to the potash deposits of Alsace. Mining began in 1910, and the production rose from 6,572 tons in 1913 to 27,838 tons in 1917. The development of the industry was retarded by the badly prepared state in which the material was marketed, but methods of purification have been improved at no great expense, and the quality of the new grade determines a ready sale. Mining is easier than in Ceylon because the deposits can be worked in the open. Indo-China is also rich in grahpite, and from Annam 8,000 tons was recently exported to America and 15,000 tons more are ready for shipment.

Of all the French colonies Tonkin is the richest in coal, the output in 1916 having reached 695,000 tons. Fresh deposits of anthracite have just been discovered. New Caledonia also has rich deposits which have hardly been touched, and the same applies to the lignite at Madagascar. Yet, in spite of these natural resources, 600,000 tons of coal was imported into the French colonies, not including those of North Africa.

The production of phosphate in Algeria and Tunis for 1920 is estimated at 1,400,000 tons, which will be distributed thus: 700,000 tons to France; 247,600 to England; 355,000 to Italy; 14,700 to Portugal; 3,600 to Belgium; 550 to Switzerland; and 73,600 to Spain.—*Journal S.C.I.*

From Week to Week

MR. E. H. PACKE has been appointed by the Treasury an ex-officio director of the Anglo-Persian Oil Co., Ltd.

MR. W. G. PALMER, of St. John's College, Cambridge, has been appointed Demonstrator of Chemistry at Cambridge University.

A FIRE broke out on Saturday in the premises of the Dennistoun Glass Works, Ltd., Glasgow, causing damage to the extent of about £800.

PALM KERNELS, copra, ground nuts, palm kernel oil, coconut oil, ground nut oil, cotton seed cake, and cotton seed meal have now been removed from Lists "A" or "B" of Prohibited Exports.

THE UNIVERSITY OF PARIS has conferred the honorary degree of doctor on Professor H. G. Grenish, Professor of Pharmaceutics to the Pharmaceutical Society of Great Britain.

THE INSTITUTION OF PETROLEUM TECHNOLOGISTS announce that on and after January 31, the address of the Institution will be 5, John Street, Adelphi, Strand, W.C. 2.

AN APPEAL FOR £100,000 is being made for the reconstruction and re-equipment of the engineering buildings at the University of London, University College.

MR. A. C. J. CHARLIER, president of the National Association of Industrial Chemists, has been re-elected president of the Federation of Technical and Scientific Associations.

A SEAM OF SHALE 11 ft. thick has been cut in Norfolk on property of English Oilfields, Ltd. It has given over 90 gallons of oil per ton of shale, or about four times the quantity obtained from Scottish shales.

ACCORDING to the Home Office and Ministry of Transport returns, out of a total of 265 workpeople reported killed in the course of their employment in December, 1919, nine were from chemical works.

A FIRE which broke out in the Provan Chemical Works of Brotherton & Co., Ltd., Glasgow, last week, spread to a series of pitch panels, containing over 1,000 tons of pitch, and caused damage estimated at £5,000.

MR. GEORGE AINSWORTH, for many years general manager of the Consett Iron Co., died on Sunday in his 70th year. Mr. Ainsworth entered the service of the firm as chemist in 1870, and had only retired a few months.

THE SUM OF £10,000 is, we understand, to be awarded by the Government of Australia for the discovery of oil in commercial quantities in Australia. The offer is believed to refer to free mineral oil, and not to a shale product.

IT IS ANNOUNCED that the Council of the Linen Industry Research Association will shortly appoint a research botanist, a research chemist and a research physicist, at commencing salaries of £500 a year.

DR. F. PANETH has been appointed Professor of Chemistry in the University of Hamburg. Dr. Paneth formerly worked on radioactivity in the laboratories of Professor F. Soddy at Glasgow, and Sir E. Rutherford, at Manchester.

THE TOTAL NUMBER of cases of poisoning reported to the Home Office under the Factory and Workshop Act during December, 1919, was 21, of which 19 were due to lead poisoning, 1 to mercurial poisoning and 1 to arsenic poisoning. There were no deaths reported.

WITH RESPECT to the first annual chemical trade dinner to be held at the Criterion Restaurant, on Thursday evening, February 12, it is requested that applications for tickets be sent in not later than January 31, so that the necessary arrangements may be made. They should be addressed to the Secretary of the British Chemical Trade Association, 80, Fenchurch Street, E.C. 3.

THE DEATH is announced of Mr. Hastings Neals, who was well known not only in oil circles in London, but more particularly in connection with oil matters in Algeria. Mr. Hastings Neals had for many years been resident in Algeria, and had been directly associated with most of the oil deals carried out in connection with that country. He was responsible for locating the first oil well in the country, and up to a few days ago was actively engaged in the country's oil matters.

AT NEWCASTLE last week J. G. Middleton, general manager of the local branch of the Lasky Film Service, was fined £50 for having kept in his office in the basement of Cross House 11 gallons of petroleum, without a licence, between October 2 and December 27. The magistrates expressed the view that the petroleum had nothing to do with the fire at Cross House on December 23, which caused the death of 12 persons.

THE BOARD OF TRADE announce that the Scientific Instruments, Glassware and Potash Production Branch and the Mineral Resources Development Department have now removed from 7, Seamore Place, Curzon Street, W. 1, to the new public offices, Great George Street, S.W. 1 (telephone number, Victoria 9,800). The office of the Controller of Trading Accounts has also removed to Great George Street from Gwydyr House Annexe, Whitehall, S.W. 1.

As a result of a mass meeting held in London last week, over 300 members of the staff of Boots, the chemists, joined the Amalgamated Society of Pharmacists, Drug and Chemical Workers. The meeting, which was the first of a series to be held all over the country, was attended by managers and qualified chemists. The meeting further decided to draw up a scale of wages for managers, qualified assistants and apprentices, to be adopted as a national scale for all Boots' shops throughout the country.

A FRIEND OF GIRTON COLLEGE, CAMBRIDGE, has given £10,000 to be applied, both capital and interest, during the next 20 years for the encouragement of research by women in mathematical, physical and natural sciences. The fund is intended to assist in the development of scientific research in relation to industry. It is thought better to devote both capital and interest during 20 years than to expend a smaller annual sum in perpetuity as would be the case if the interest only of the fund were expended

PROFESSOR T. H. EASTERFIELD, Professor of Chemistry in the University of New Zealand, has been appointed Director of the Cawthorn Research Institute, which is to be established with the sum of £240,000 bequeathed by the late Mr. Thomas Cawthorn, of Nelson, for founding a Technical Institute in New Zealand. The chief work of the Institute will be "instruction in the performance of scientific research; such research to be definitely related to the industries of Nelson and the Dominion."

MR. ROBERT KIDNEY, secretary to the Federation of Irish Chemists (Employers) Association, and Mr. J. E. Payne, Organiser of the National Union of Shop Assistants, Warehousemen and Chemists (Chemists' Section), state that terms of settlement have been ratified between the Federation of Irish Chemists Employers' Associations and the National Union of Shop Assistants, Warehousemen and Clerks (Chemists' Section), and will apply to the whole of Ireland, binding both employers and employees.

THE RESEARCH SCHEME instituted by the Council of the Society of Dyers and Colourists in March, 1914, is now working in co-operation with the Government Department of Scientific and Industrial Research. Chemistry, bleaching, dyeing and finishing, calico printing and leather dyeing are the five sections into which the scheme is divided. The Council state that the greatest difficulty at present is to obtain the services of investigators and assistants with the necessary qualifications. and they would welcome any help in this direction.

AN OUTBREAK OF FIRE occurred at Bearpark Colliery by-product works, near Durham, on Sunday. Flames were observed issuing from the tanks used for the production of benzol, and the colliery fire brigades were at once summoned. In the meantime the by-passes at each end of the scrubbers were turned off in order to prevent the fire from spreading. The firemen could do little more than check the extension of the flames to large tanks, in which several thousand gallons of benzol were stored. The amount of damage done will not be known until the plant is again working.

MR. C. SYKES (works manager), on behalf of the employees of Albright & Wilson, Oldbury Phosphorus Works, on Tuesday made a presentation to Mr. J. W. Wilson, M.P., on the occasion of his recent marriage. Sir R. Threlfall, in the course of a speech, said it was not generally known that phosphorus was largely used in the preparation of artificial fog that played such an important part in winning the war, and the Oldbury Phosphorus Works had contributed in saving hundreds of thousands of lives and achieving victory. The presentation consisted of an illuminated address to Mr. Wilson and a valise to Mrs. Wilson.

MR. P. G. KEMP presided on Thursday, January 15, at the second of a series of lectures under the auspices of the Chesterfield Sub-branch of the Association of Engineering and Shipbuilding Draughtsmen and the local Education Committee, when Mr. Frank S. Marsh, M.Sc., spoke on "Gas Cylinders." Several representative cylinders were exhibited, and a small cylinder was actually hydraulically tested. The various regulations governing the manufacture of gas cylinders were discussed and compared, and the uses to which the cylinders are put were well illustrated by experiments, which also indicated the dangers which exist when cylinders are used for other purposes than those for which they are intended.

THE DEATH IS ANNOUNCED of Mr. E. C. McKelvy, of the Chemical Division of the Bureau of Standards, Washington, from burns caused by an explosion of ammonia condensing apparatus containing petroleum-ether cooled by liquid air. Mr. McKelvy was born at Upper Sandusky, Ohio, on May 9, 1884. He joined the staff of the Bureau of Standards in July, 1907, and was chief of the physico-chemical section of the Chemistry Division at the time of his death. His work for several years past had been on the physical constants of ammonia and other substances used in commercial refrigeration. He was a member of the Washington Academy of Sciences and one of the associate editors of its "Journal," and had been secretary of the American Chemical Society since 1915.

It is authoritatively stated at Huddersfield that a Committee of Expert Dye-Users, representing the cotton and woollen textile, and paint and varnish trades, has left this country for Germany in order to purchase large supplies of fine dyes in that country for use by British consumers. The committee, which has been sent out on behalf of the Board of Trade, consists of representatives of the Trade and Licensing Sub-committee of the Board. The committee is authorised to spend between one and a-half and two million pounds on these dyes, and the British Government will make financial arrangements. Any dyes that the committee will purchase will be in

addition to 1,500 tons to which British users are entitled under the reparation clause of the Peace Treaty. The committee left England last week-end, and will be in Germany about a fortnight.

MESSRS. BEVERLEY, PEACE & PARTNERS, of 83, Pall Mall, London, S.W. 1, have acquired, on behalf of Mr. J. C. Nixon, of Belfast, well known as a grower in Ireland, all the Government flax factories in the Selby, Peterborough and Suffolk districts. The price is said to be between half and three-quarters of a million pounds. Mr. W. Gavin, chairman of Messrs. Beverley, Peace & Partners, who was the first director of flax production in this country, and two other demobilised officers in the firm, have an interest in the new venture. Associated also with the deal are Mr. Maurice Godfrey, of Fecamp, Normandy, the largest flax producer in France, and Messrs. F. G. Foster & Co., of Selby. The deal, it is stated, embraces all the mills taken over by the Government during the war, except those in the Somerset area.

ORDERS HAVE BEEN GIVEN by M. Jules Cels, French Under-Secretary of State for Public Works, for the construction of a pipe line, to be finished within one year, for the conveyance of crude oil from Havre to Paris, though the question of concession and credits is reserved for consideration later by Parliament. The Compagnie Française des Mazouts et Pétroles is the firm which has made the tender. The work will comprise a special quay at Havre, the two termini, and five intermediate pumping-stations. Two pipes will run to Paris; the larger, of 25 cm. bore, will convey 4,500 tons of heavy combustible petroleum oil, and the smaller, of 10 cm., 1,000 tons of petrol daily. The pipelines, which run below the soil, will follow the Routes Nationales, passing Bolbec, Yvetot, Barantin, Rouen and Pontoise. The whole enterprise, including the construction of the receiving tanks at Havre and Paris and a telephone, is estimated to cost 90,000,000f.—that is, £3,600,000 at normal exchange.

MR. E. C. POWELL, of the Bow Bridge Dyes and Chemical Works, in a recent letter to the *Times*, on the subject of British Dyes and Transport, states: "The underlying cause of many trading difficulties is in danger of being over-shadowed by the more apparent and therefore remediable symptoms. By the time active hostilities were brought to a close by the Armistice, the system of control of transport worked by 'priorities' had become almost as useful to traders as the cab shafts to the tired-out cab horse, but now that we have the 'control' without the 'priorities' and with none of the stimulus of war necessities, the dead hand on 'transport' is strangling us all. Government control of transport appears to take away all incentive, and instead of railway companies pushing traffic through under the spur of competition, with dividends fixed and nothing to gain by pushing on, the A.B.C. Rail Company are more than apt to suggest that the D.E.F. Rail Company are not so full up as they are, and it takes weeks of effort to get either to accept any traffic, with disastrous results to both production and delivery.

AT THE MONTHLY MEETING of the Chemical Industry Club London, on Monday evening, Mr. Bernard Davis presided, and Mr. Coley (the hon. secretary) made an interesting statement as to the club's recent progress in membership. It was announced that the committee proposed to arrange a series of meetings for Papers and discussions, and members were invited to send in suggestions as to subjects and speakers. During the evening Dr. R. E. Slade delivered an interesting address on "Some Aspects of the Photographic Industry," in which he briefly sketched the history of photography, and discussed the scheme and work of the Photographic Research Association. In the course of discussion, which was freely taken part in, emphasis was placed on the need of so regulating the work of the Research Association as not unfairly to encroach on the field of the private consulting chemist, and acknowledgment was made of the extremely important work done with the aerial camera during the war. There was, of course, the inevitable reference to Germany as the source of photographic chemicals, and it was pointed out that Germany's success was largely due to the industry being linked up with the dyes industry.

COL. SIR FREDERIC NATHAN has been appointed Power Alcohol Investigation Officer under the Fuel Research Board of the Department of Scientific and Industrial Research. The appointment has been made as a result of the consideration given to the report of the Inter-departmental Committee on the Production and Utilisation of Alcohol for Power and Traction Purposes, which recommended the establishment of a small permanent organisation under the department to continue investigations into these problems. Before the war Sir Frederic Nathan was expert of the Royal Gunpowder Factory at Waltham Abbey, and later was works manager of Messrs. Nobel's Explosives Factory at Ardeer. During the war he was the officer in control of alcohol under the Ministry of Munitions and chairman of the Production Section of the Inter-Departmental Committee on the Production and Utilisation of Alcohol for Power and Traction Purposes. Another appointment under the Fuel Research Board is that of Professor Pierce Purcell, who was secretary of the Irish Peat Inquiry Committee, to the post of peat investigation officer. His duties will be to keep the Board informed of progress in peat utilisation research, to continue and extend experiments on the mechanical cutting and winning of peat, and to arrange for tests of peat as boiler fuel.

Pioneers in Aircraft

A COMMENDABLE instance of enterprise in technical and trade journalism is afforded by our contemporary, *Aeronautics*, which this week announces a dinner it is arranging to give to the survivors of the first hundred British aviators and the pioneers of British aviation. The proprietors of *Aeronautics* are to be congratulated on so happy and enterprising an experiment. A list of the guests who are to be thus honoured is given, and it certainly possesses uncommon interest. The opportunity will be taken to pay tribute to the memory of the martyrs to the new science. The Chairman will be Major-General Seely, C.B., D.S.O., late Under Secretary for Air.

Rate of Exchange for Enemy Debts

THE Controller notifies that the pre-war rate of exchange on Germany referred to in the Treaty of Peace at which debts or claims against German nationals are convertible into British currency is: Marks 20·5075 equals £1, and that the calculation must be made by the creditor or debtor before preferring his claim or tendering payment of his debt. Notice is also given to debtors of German nationals for sums of under £50, who were not required under the Proclamation to register their debts with the Public Trustee, that they are required at once to pay to the Controller at Cornwall House, Stamford Street, S.E. 1, the amount of such debts, with interest at 5 per cent. per annum from August 4, 1914, except in cases where the debtor is liable to pay interest at some different rate or from some other date.

Experiments on Acid Resisting Metals

THE current number of *Chimie et Industrie* contains an interesting article by C. Matignon on acid-resisting metals. The strength and other physical and chemical properties of ferro-silicon containing various percentages of silicon are fully discussed. Some results of experiments by Kowalke, in America in 1917, on the effect of sulphuric, nitric and hydrochloric acids on ferro-silicon are given, and these show that the chemical action rapidly decreases to a minimum as the percentage of silicon increases to 16–18 per cent., and then increases again with a further increase of silicon. These experiments were made with cold acid; but the author has extended the investigation to the action of boiling acids. Sulphuric acid is not discussed, as the action is known to be small; but the action of boiling, concentrated and dilute nitric acid, and also organic acids, was tried. The period of the experiments varied from 50 to 320 hours, and it was found that the action becomes progressively slower with time. The alloy which was found most resistant to nitric acid was "métillure," containing 16·92 per cent. of silicon and 0·88 per cent. of manganese. All the alloys were found to be less resistant to organic acids than to nitric acid. The properties of ferro-boron were also examined, but its resistance to acids is inferior to ferro-silicon.

Alsatian and German Potash

MONSIEUR P. A. HELMER, of Colmar (Alsace), the official custodian of the Alsatian potash mines, who has just been elected a member of the French Senate, stated in a recent speech that the sale of potash on a joint basis had been secured through the formation of an organisation which embraced all the mines. All orders were collected by this organisation and passed on to the various mines; it centralised and distributed the orders, directed the despatching, and arranged for the transport of the salts by rail and water. There was a special department which supplied information regarding the uses of potash and carried out experiments on the various types of soils. This organisation, he contended, should be maintained so as to be able to cope with the German Kalisyndicat. Ever since the armistice, he added, Germany had tried to enter into negotiations with France with a view to coming to an arrangement regarding the sale of potash. He opposed any agreement with the German mines which would re-establish the pre-war monopoly. Inevitably they would be the weaker party, and as they would be acting contrary to the interests of the Allies they would lose sympathy. Great Britain, who heartily welcomed Alsatian potash, had made a formal demand that the Alsatian authorities should not enter into an agreement which would be against her interests.

It is stated that the German potash mines are not in a flourishing condition, and that the negotiations between the Kalisyndikat of Berlin and the United States respecting German potash supplies have been broken off.

Recent Wills

Sir John Brunner, chairman of Brunner, Mond & Co. and other companies (net personalty being £768,740)	£899,112
Mr. Hugh Carnduff, of Blackpool, cashier, formerly Anglo-American Oil Co., Ltd., Manchester	£5,393
Mr. J. A. Maclean, of Manchester, calico printer	£63,456
Mr. E. C. Rees, of Gosforth, oil refiner	£19,557
Mr. J. Campbell, of Morecambe, soap manufacturer	£5,950
Mr. J. Noaks, of Croydon, oil and colour merchant	£5,555

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COKE OVENS. Coke oven machines. *Engineering*, January 16, 78, and two-page plate. Deals with some machinery used in connection with coke-oven operations.

DOLOMITES. A comparison of dolomites. A. Rothrock. *Chem. News*, January 16, 29-31. Analyses of specimens from various localities are given.

DYES. Non-aromatic intermediates in dye manufacture. J. T. Hewitt. *J. Soc. Dyers and Col.*, January, 6-11. A useful account of non-aromatic monatomic alcohols, aldehydes and acids used as dye intermediates.

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ETHYL CHLORIDE. The technical applications of ethyl chloride. A. Henning. *J. Soc. Chem. Ind.*, January 15, 1-8T. The production, properties and uses of ethyl chloride are fully dealt with (see also CHEM. AGE, December 6, 1919, 665).

FERTILISERS. Artificial nitrogenous fertilisers. E. J. Russell. *J. Soc. Chem. Ind.*, January 15, 5-6R. Comparative tests on the action of nitrogen applied as nitrates, ammonium salt and cyanamide are quoted.

GLASS. Glass and some of its problems. H. Jackson. *J. Roy. Soc. Arts*, January 16, 134-146. Trueman Wood Lecture.

MOTOR FUELS. Producer gas for motor vehicles. D. J. Smith. *Engineering*, January 16, 92-95. Conclusion of Paper already mentioned (CHEM. AGE, 1920, 74).

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POISONING. The International Labour Conference and industrial poisoning. S. Miall. *J. Soc. Chem. Ind.*, January 15, 4-5R. An account of the work of the Conference at Washington in November last.

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SODIUM. Sodium and sodium compounds in 1918. *J. Soc. Chem. Ind.*, January 15, 7-9R. A summary of a report of the U.S. Geological survey.

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ZINC. Review of the spelter situation. H. M. Ridge. *J. Soc. Chem. Ind.*, January 15, 6-7R.

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COAL. Studies on the washing of coal. A. Moreau. *Rev. Met.*, November-December, 416-435. A mathematical and experimental treatment of the subject.

COPPER ALLOYS. Influence of cadmium on the properties of brasses. L. Guillet. *Rev. Met.*, November-December, 405-415. A number of tests are described and illustrated with photomicrographs.

The dilation of copper-antimony alloys. P. Braesco. *Comptes rend.*, January 12, 103-105.

NITROGEN COMPOUNDS. The formation of nitric acid from nitric oxide. A. Sanfourche. *Bull. Soc. Chem.*, December, 633-655. The action of dry air on nitric oxide, and the equilibria in presence of moisture have been studied.

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The McCrudden gravimetric calcium method modified. J. O. Halverson and J. A. Schulz. *J. Ind. Eng. Chem.*, January, 77-78.

Determination of combustible matter in silicate and carbonate rocks. A. C. Fieldner, W. A. Selvig and G. B. Taylor. *U.S. Bureau of Mines, Tech. Paper* 212, 18 pp.

BRONZES. Copper-aluminium-iron-bronze as an acid-resisting alloy. O. L. Kowalke. *Chem. and Met. Eng.*, January 7, 37-38. Data on the resistance of the alloy to sulphuric acid are quoted.

CHROMIC ACID. The continuous process for electrolytic regeneration of chromic acid. R. H. McKee and S. T. Leo. *J. Ind. Eng. Chem.*, January, 16-26. The process is applicable to waste liquors from tanneries, dye-works, &c.

CRESOL. Purified cresol (cresylic acid). H. C. Hamilton. *J. Ind. Eng. Chem.*, January, 50-52. The method described is believed to be commercially economical and feasible.

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FABRICS. Determination of the water-resistance of fabrics. F. P. Veitch and T. D. Jarrell. *J. Ind. Eng. Chem.*, January, 26-31. The methods used in the leather and paper laboratories of the U.S. Bureau of Chemistry are detailed.

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Present status of American glassware. E. C. Sullivan. *Chem. and Met. Eng.*, January 7, 29-30.

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The cleaning of sheet steel and iron for enamelling purposes. R. R. Danielson. *J. Amer. Ceram. Soc.*, November, 883-894. A summary of the methods in current use is given.

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Constant-temperature still-head for light oil fractionation. F. M. Washburn. *J. Ind. Eng. Chem.*, January, 73-77.

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Recent developments in the absorption process for recovering gasoline from natural gas. W. P. Dykema. *U.S. Bureau of Mines, Bull.* 176. 90 pp.

SHALES. Recovery of the nitrogen contained in oil shales. L. Simpson. *Chem. and Met. Eng.*, January 7, 20-22.

TUNGSTEN. Manufacture of pure tungsten metal. C. H. Jones. *Chem. and Met. Eng.*, January 7, 9-16. The uses of the metal are discussed and the process and plant used by the Fansteel Products Co. described.

URANIUM. The analytical chemistry of uranium and its separation from other rare elements. C. A. Pierlé. *J. Ind. Eng. Chem.*, January, 60-63.

WOOD. Care of the lumber pile in chemical plants. *Chem. and Met. Eng.*, January 7, 16. Useful notes on the preservation of timber.

ZINC. Chemically pure zinc for fixation of the temperature scale. A. O. Ashman. *Chem. and Met. Eng.*, January 7, 22.

Recovery of zinc from low-grade and complex ores. D. A. Lyon and O. C. Ralston. *U.S. Bureau of Mines, Bull.* 168. 145 pp.

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ANALYSIS. Micro-analytical estimation of carbon dioxide and water in the analysis of minerals. G. K. Almström. *J. prakt. Chem.*, November, 312-316.

MINERAL OILS. Removal of aromatic hydrocarbons from mineral oils by means of trioxymethylene sulphonic acid. J. Tausz. *J. prakt. Chem.*, November, 276-280.

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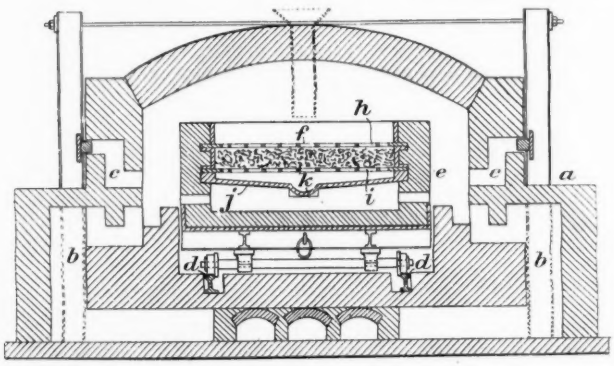
Patent Literature

We publish each week a list of selected complete specifications accepted as and when they are actually printed and on sale. In addition, we give abstracts within a week of the specifications being obtainable. Readers can thus decide what specifications are of sufficient interest to warrant purchase, the only way of obtaining complete information. A list of International Convention specifications open to inspection before acceptance is added, and abstracts are given as soon as possible.

Abstracts of Complete Specifications

136,577. TUNGSTATES, METHOD OF AND MEANS FOR THE SEPARATION OF FUSIBLE, FROM THE GANGUE RESULTING FROM THE DECOMPOSITION OF THE ORE. C. J. Head, Norfolk House, Laurence Pountney Hill, London. Application date, June 27, 1917.

Scheelite or wolframite is finely ground and mixed with an alkali such as soda ash in excess, in order to form a fusible salt having a lower fusion temperature than that of the remainder of the ore under treatment. The furnace *a* is provided with gas passages *b* and air passages *c*, and the fusion hearth *f* is formed on a bogie truck *e* running on rails *d*. The mixed materials are first fed on to a cast-iron plate on the same level



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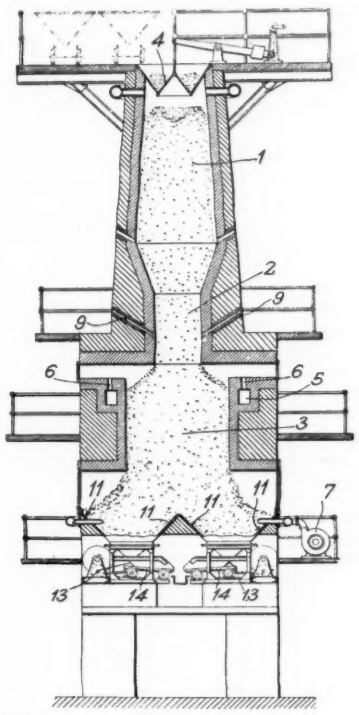
as the perforated plate *h*, each plate occupying half the length of the truck. The mixture is rabbled from time to time, and when fusion is completed the mass is pushed on to the perforated plate *h*, where it is further rabbled to free the fused tungstates. The fused salt is filtered from the gangue by means of the filtering material contained between the perforated plates *h* and *i*. The filtering material is preferably graded wolframite, and the excess of soda ash thus absorbs more tungstic oxide and produces an enriched sodium tungstate. If the treated ore is good grade wolframite, the filtering material may be scrap iron turnings. The fused salt finally passes out by the channel *k* in the container *j*.

136,585. CARBONACEOUS MATERIAL, APPARATUS FOR THE DISTILLATION OF SOLID. C. D. Burney, 20, Wilton Crescent, Belgrave Square, London. Application dates, August 31 and November 21, 1918.

The apparatus is for the low temperature distillation of coal, cannel, lignite, shale, peat, &c., out of contact with the heating gases. The heating gas is generated in a combustion chamber external to the retort, and is passed through it in the opposite direction to that of the material. The material is fed in at one end of the horizontal retort, and is moved progressively through it by means of a hollow helical conveyor. The hot gas enters the hollow shaft of the conveyor at the other end, and passes into the hollow screw thread at one or more points, so that the material is heated by conduction through the walls of the conveyor. The heating gas passes out at the other end through the hollow shaft. The products of distillation are withdrawn at various points along the length of the retort. In an alternative form, the shaft carrying the hollow conveyor may be solid or filled with refractory material. The temperature gradient in the retort may be controlled either by altering the pressure of the gas supplied to the conveyor or by varying the velocity through the conveyor. The solid material in the retort may be disintegrated by an archimedean screw, the blade of which rotates between the helices of the hollow conveyor. The products of distillation are passed through settling chambers, and then to condensers.

136,588. BURNING OR ROASTING NON-SINTERING SUBSTANCES, GAS-FIRED SHAFT KILNS FOR. A. Steiger, 6, Ramistrasse, Zurich, and W. W. Steiger, 39, Böcklinstrasse, Zurich, Switzerland. Application date, October 14, 1918.

The material to be treated is fed by the hopper 4 into the pre-heating zone 1 of the kiln, and then passes into the combustion zone 2. The firing gases are passed through the annular conduit 5 and channels 6 into the space immediately below the zone 2, and the air for combustion is forced by the fan 7 through the cooling zone 3 to pre-heat it. The gases



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burn in the lower part of the zone 2, where the most intense heating takes place, and additional air may be supplied through the conduits 9. The roasted material passes down into the cooling zone 3, where the sudden increase in cross-section loosens it and facilitates the upward passage of air. The material is again loosened by expansion below the zone 3, and passes to two discharge openings between the sloping surfaces 11, which support most of the weight. The material is continuously discharged by oblique surfaces 13 on to reciprocating floors 14, so that the material in the kiln is continuously moved through it while being treated.

136,651. EVAPORATING OR CONCENTRATING LIQUIDS, APPARATUS FOR. B. Shaw, Broad Street House, London. Application date, December 19, 1918.

The apparatus is of the type in which the liquid is forced through a spiral passage between two concentric cylinders, the whole being surrounded by a steam jacket. The spiral

plate forming the spiral passage is attached to the inner cylinder, and a slight space is left between the outer edge of the spiral plate and the surrounding cylinder to provide a continuous passage for some of the liquid. The object of the continuous passage was to ensure the complete covering of the heated wall, and prevent local overheating. It is found that overheating still occurs with some liquids when a deposit is formed on the outer heated wall, and to avoid this an automatic scraper is provided. This comprises a longitudinal strip of spring steel, slightly curved and attached along its centre line to the outer edges of the spiral plate. The two edges of the strip are thus in contact with the heated wall, and the inner cylinder carrying the strip is oscillated or rotated so as to scrape off the deposit on the heated wall.

136,716. CAOUTCHOUC AND CAOUTCHOUC-LIKE SUBSTANCES, PROCESS FOR ACCELERATING THE VULCANISATION OF. S. J. Peachey, 5, Yew Tree Road, Davenport, Cheshire. Application date, February 21, 1919.

It is found that the vulcanisation of indiarubber is completed in from one-half to one-third of the usual time if 0·5 to 0·6 per cent. of nitrosobenzene (C_6H_5NO) is added. Any nitroso hydrocarbon of the cyclic series having a similar constitution may alternatively be used.

136,718. POTASSIUM COMPOUNDS, APPARATUS FOR RECOVERING. H. Fairbrother, London. (From Chemical Construction Co., Los Angeles, Cal., U.S.A.) Application date, February 24, 1919.

The invention consists in the *apparatus* for recovering potassium compounds from the gases from cement kilns, which has already been described and illustrated in connection with 135,720. (*See* THE CHEMICAL AGE, Vol. II., p. 22.)

136,750. CYANIDES, METHOD OF MANUFACTURING. W. J. Mellersh-Jackson, London. (From Air Reduction Co., Incorporated, 120, Broadway, New York.) Application date, April 23, 1919.

Carbonaceous material, alkali metal compound, and a reducible iron compound, are separately finely ground so as to pass a 100 mesh sieve. The iron may be added in the form of iron ore or oxide, or other reducible compound, preferably to an amount sufficient to provide 2 per cent. of iron calculated on the weight of the furnace charge. Alternatively, the iron may be added in the form of a soluble salt, or as a previously prepared solution. The solid ingredients are mixed dry, and then added to water in a mixing machine, and mixed to a creamy consistency. More dry mixture is then added until the mass becomes granular, and it is then transferred to an inclined cylindrical retort. The retort is open at the upper end and closed at the lower end, and passes completely through the combustion chamber. The retort is provided at both ends outside the combustion chamber with roller bearings, and is rotated by a chain and sprocket wheel. Nitrogen is continuously admitted by a pipe at the lower end of the retort, which is preferably heated externally by producer gas. The retort is rotated at about 1 revolution per minute, and is heated till the material within reaches a temperature of 950°C.-1050°C., while nitrogen is passed through at a pressure of about 1 in. of mercury. With a charge of soda ash and coke, the resulting product consists of sodium cyanide, sodium oxide and sodium carbonate, and this is leached with a mixture of water and an organic solvent such as alcohol. The cyanide is obtained substantially free from ferrocyanide, and the difficulties previously experienced when a large proportion of iron catalyst was used are avoided. The proportion of iron should not exceed 5 per cent., and it is preferably added as a compound and not in the metallic state.

136,758. MIXING, CIRCULATING AND AGITATING MATERIALS IN A LIQUID OR SEMI-LIQUID STATE, APPARATUS FOR. W. J. Coles, 23, Montgomery Road, Sheffield, and Edgar Allen & Co., Ltd., Imperial Steel Works, Sheffield. Application date, May 19, 1919.

The containing vessel is provided with one or more mechanical agitators, each consisting of a framework extending substantially the whole depth of the vessel, and mounted on a vertical rotating shaft. The mechanical agitator is combined with a pipe system by which compressed air or gas is forced into the liquid to assist in the agitation. The upper part of each vertical shaft is made hollow, and communicates with horizontal distributing tubes mounted on the stirring arms, which, in turn, communicate with vertical tubes having their open ends near the bottom of the vessel. The jets of compressed air are thus rotated with the mechanical agitator, and a more effective mixing is obtained. The horizontal pipes are supported on transverse members carried by the upper horizontal part of the framework, and are retained in position by clips which may be locked in their closed position. The lower ends of the vertical pipes are secured in slotted plates which are attached transversely to the lower members of the framework.

136,768. RADIUM, PRODUCTION OF COMPOUNDS OF. H. O. Hedström, Djursholm, Sweden. Application date, June 6, 1919.

The process is for the production of compounds of radium from minerals or other materials containing radium and uranium. The extraction of radium may be effected at any temperature between 10°C. and 100°C. by means of liquid sulphur dioxide in a closed vessel. If the extract containing the radium compounds also contains oils, which may occur when treating materials such as Swedish alum slates of the Cambrian formation, or "kolm," the oils are first separated from the extract, which is then treated for producing barium-radium compounds. When such carbonaceous materials are treated, they may first be subjected to a burning or distilling process, and the residue is then subjected to extraction by means of sulphur dioxide.

136,772. CYANIDES, PRODUCTION OF. C. T. Thorssell and H. L. R. Lunden, 20, Köpmansgatan, Gothenburg, Sweden. Application date, June 20, 1919.

In the process for the fixation of nitrogen in the form of cyanide by allowing it to react on a mixture of coal and alkali metal compound or alkaline earth metal compound at high temperatures, it is important to return the alkali or like compound back to the process, in order to render the process continuous. The material brought back, however, is detrimentally affected by the presence of silicic acid and alumina, which form silicates and aluminates, and the object of the invention is the elimination of the silicates and aluminates. After the reaction mass has been treated with water for the conversion of the nitrogen compound into ammonia, the silicate and aluminate are decomposed by a stronger acid than silicic, such as carbonic formic or acetic acids, and the silica is precipitated and removed. The acid must contain no elements other than oxygen, hydrogen, carbon, and nitrogen, and carbon dioxide must not be used when alkaline earth compounds have been used, as their carbonates are insoluble. If acetic acid is used, the acetate is heated to convert it into carbonate, which is then returned to the process. Instead of using acids, calcium oxide may be used.

136,790. FUEL. J. V. Eyre, 24, St. Ann's Road, Chertsey, Surrey. Application date, September 12, 1919.

The fuel consists of coal dust, 6·5 to 10 parts; pitch, 1·5 to 3·5 parts; and sawdust, 2 to 3·25 parts. The mixture is heated to 250°F. and agitated, and then compressed into briquettes and immersed in water.

International Specifications Not Yet Accepted

134,825. ROASTING ORES. Electrolytic Zinc Co. of Australasia Proprietary, Ltd., 360, Collins Street, Melbourne. International Convention date, November 7, 1918.

Sulphide ores, concentrates, tailings, &c., particularly zinc blende, are roasted first at a high temperature to reduce the sulphur contents to about 6 to 10 per cent., and then at a lower temperature with a controlled air supply and with or without the addition of unroasted or sulphatised material, so as to form the maximum amount of sulphates. Alternatively, the first roast may be a dead roast, and fresh ore or other sulphide material is afterwards added in successive quantities to bring the sulphide sulphur contents to about 2 per cent. at each addition. The material is then subjected to the sulphatising roast. Iron oxide may be added to act as a catalyst if not present in the ore. The roasting process may be preparatory to leaching for the preparation of sulphate solutions in the manufacture of lithopone.

LATEST NOTIFICATIONS

137,513. Zinc Oxides, Manufacture of. New Jersey Zinc Co. January 8, 1919.
137,514. Oil, Process for the Extraction and Refining of. F. M. Heyerdahl. January 9, 1919.
137,519. Potassium Sulphate, Manufacture of. Fabriques de Produits Chimiques de Thann et de Mulhouse. December 31, 1918.
137,529. High Explosives, Processes for the Conversion of, and Products resulting therefrom. E. Bielouss. January 6, 1919.
137,534. Cement, Method of Making. F. L. Smidth & Co. January 8, 1919.

Specifications Accepted, with Date of Application

113,271. Water Gas, Manufacture of. Compagnie pour la Fabrication des Compteurs and Materiel d'Usines a Gaz. January 31, 1917.
122,828. Electric Furnaces. Armour Fertiliser Works. January 28, 1918.
135,818. Electro-osmotically removing Liquids from Materials, Apparatus for. Elektro-Osmose Akt.-Ges. (*Graf Schwerin Ges.*) October 20, 1917.
136,853. Nitrogenous Animal Waste, Process for Treating. E. C. R. Marks. (*Firm of C. F. Hildebrandt.*) November 14, 1917.
136,860. Furnaces, Lining of. W. C. Ely. September 9, 1918.
136,868. Distillation of Fuel, Low-temperature. Merz & McLellan, A. C. Michie and E. G. Weeks. November 20, 1918.
136,870. Oil, Extraction of, by Volatile Solvents. A. W. Macllwaine and G. F. Holdcroft. December 8, 1918.
136,873. Decolorising Vegetable Carbon, Manufacture of. C. E. Eastick and S. P. Eastick. December 16, 1918.
136,880. Coke Ovens and the like, Carbonisation of Fuel by Vertical. W. E. Davies. December 19, 1918.
136,896. Chemical Reactions, Method and Apparatus for Carrying out certain. T. Hughes. December 21, 1918.
136,927. Varnishes or Dopes, Manufacture of. Titanine, Ltd., and P. E. Bowles. January 7, 1919.
136,960. Electric Furnaces. Watson & Co., H. A. Greaves, H. Etchells and W. Travis. February 21, 1919.
136,979. Calcium Citrate, Purification of, and Manufacture of Citric Acid. H. D. Golding, J. Raschen, and United Alkali Co. March 20, 1919.
136,992. Analysing Gases, Absorption Apparatus for. P. R. Boulton. April 10, 1919.
137,005. Coke Ovens. W. P. Thompson. (*Fours and Procedes Mathy Soc. Anon.*) June 4, 1919.

A World Market in Paris

(REUTER'S TRADE SERVICE)

THE proposal to create in Paris a vast world market to be called "The Paris Marché du Monde," where producers and buyers of the entire world may meet and do business all the year round, has created considerable interest in commercial circles. The scheme is grandiose in character. A huge palace, 800 ft. long by 900 ft. wide, is to be erected near the Trocadero on the right bank of the Seine to give accommodation to 5,000 firms. It is estimated that it will take over two years to build, and that the cost will be about £6,500,000.

Reuter's Correspondent went last week to see the President of the British Chamber of Commerce in Paris to inquire as to the view of the Chamber regarding the new venture. Mr. Hounsfield said that it was only the day before that he had been informed officially of the scheme and that so far he had received little information as to the details and had consequently been unable to study the proposal personally or to bring it to the notice of his board. He thought, however, that the plan was on the right lines provided it could be carried out on a practical and commercial basis. If so carried out, it would certainly be of service to international trade.

M. Leon de Breviare, the director in France for Great Britain and its Dominions of the Paris Marché du Monde, said that this was a private enterprise and that all its directors were Frenchmen. He hoped that when the scheme became known throughout the world it might be put on an international footing with representatives from the leading countries on the Board of Directors and with shares taken up everywhere. There need be no fear, he said, that the project would not be carried through. The company has the financial backing of one of the most important French banking firms, he added, and even if that failed, the directors were wealthy enough to subscribe the necessary capital ten times over and were determined to make a success of the scheme.

To show how official France viewed the project, M. de Breviare observed that the Paris Municipal Council and the Council-General of the Seine had formally given their approval and had asked French business men to extend every help in order to make the scheme a reality as soon as possible. This, he said, was the first time that either of these bodies had given official support to a private enterprise, which showed how important and how likely to succeed they considered the project.

Anyone wishing to take up space in the projected building can now do so. The space is to be divided into units of 15 sq. metres, but up to four units can be taken. Leases may be taken for three, six, or twelve years at roughly £200 per year per unit. The rents for six and twelve years are smaller in proportion than those for three years. Yearly tenancies will not be allowed. Prospective occupiers of space who wish to secure a place will be asked to deposit half of the first year's rent, when construction has begun, in a responsible bank. The money will lie to their credit and they will receive the interest until they enter into possession of the space demanded in the complete buildings. It is expected that the buildings will be commenced in the spring and completed in a little over two years. The comfort of both buyers and sellers will be given special attention. There will be an up-to-date club, a gymnasium, swimming bath, reading and writing rooms, banking facilities and a staff of experts to give advice regarding export and import technicalities, as well as interpreters, typists, &c.

Dutch Quinine Sulphate Monopoly

The Advance in Prices

THE findings by the Board of Trade on consideration of a report by a Committee appointed to investigate the position of prices and supply of quinine sulphate, under the Profiteering Act, 1919, were published last week as a White Paper.

At the present time, the paper says, the supply of quinine sulphate is practically a Dutch monopoly, owing to the fact that almost the whole of the world's supplies of cinchona bark are drawn from Dutch and Anglo-Dutch plantations in Java; the Dutch owners are some 120 in number, and the British six—the former furnishing ten-elevenths and the latter one-eleventh of the total Java production; Messrs. Howards & Sons, Ltd., of Ilford, are the only British users of the bark. At the present time, therefore, the price of cinchona bark and quinine sulphate can be dictated by the Dutch by reason of their virtual monopoly of the world's supply.

During the war, in order to obtain sufficient supplies, an Inter-Allied Committee, working through the Association of Quinine Manufacturers in Allied countries, made an agreement with the Dutch manufacturers, from September 3, 1918, to September 1, 1919, under which a sufficiency of cinchona bark and quinine was secured. The price paid to the Dutch manufacturers was about 1s. 8d. per oz. in Java. After the Armistice the British Quinine Corporation of 14 firms was formed, and a contract, dated May 29, 1919, was made with the Dutch manufacturers to come into force after September 2, 1919. One clause in the contract prohibited any member of the Corporation to dispose of quinine sulphate at a price less than the official price fixed by the Kina Bureau at Amsterdam.

At the expiry of the "war contract" with the Dutch combine on September 1, 1919, the Kina Bureau immediately notified the members of the British Quinine Corporation that they had fixed a new minimum price of quinine of 3s. 5d. per oz. (for quantities of not less than 35 kilos)—an immediate increase of at least 6d. on the basic price in force in the United Kingdom under control. The actual cost price in Java cannot be more than 1s. 8d. an oz.

On August 26, 1919, the War Office Contracts Department sold to the British Quinine Corporation 840,000 oz. of quinine (80 per cent. of their surplus stock) at 2s. 11d. per oz. Before this sale was actually made the Department were assured by Mr. Abrahamson, the managing director of the corporation, that the price of quinine sulphate in this country would, on the removal of Government control, almost certainly fall. In the closing days of August the corporation requested the Government to accept immediate payment—no less a sum than £125,000. The effect of the rise to 3s. 5d. per oz. was to increase the value of the quinine bought by £21,000.

Abbinal Chemical Products Ltd, and Leather Polishing

IN the King's Bench Division on Monday, Mr. Justice A. T. Lawrence had before himthe case of Wm. Henry Couch against Abbinal Chemical Products, Ltd., and J. Taylor. Mr. Harry Atkins (for plaintiff) said this was a motion for judgment in default of appearance by defendants. Plaintiff was the inventor and owner of a secret process for polishing leather. In April, 1919, the parties entered into an agreement which was signed by Taylor for the defendant company. In consideration of plaintiff's services defendants agreed to repay plaintiff his expenses in applying for a patent in England; to pay him a commission on sale of the commodity, and a further £500 yearly. In breach of this defendants had not repaid plaintiff his expenses, neither had they proceeded with the manufacture of the commodity or made any payment at all. The exact position was that Taylor signed the agreement, but it apparently was never ratified by the company. There was, therefore, an alternative claim against Taylor, and as plaintiff was technically entitled to judgment against him, in the circumstances, he would take it in that form.

Judgment was entered for plaintiff against Taylor for £35 10s., the amount expended in patent fees, &c., and £250 salary due for six months ending September 30, 1919.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

Market Report

THURSDAY, January 22, 1920.

The activity which we reported in last week's issue has been fully maintained, and appears likely to continue for some time. All prices still show an upward tendency, and markets are exceedingly firm. In view of the general shortage of supplies and of the big demand for the Home trade, it becomes increasingly impossible to handle the large export business which is on hand.

General Chemicals

ACID, ACETIC.—A large business is passing, and makers are expected to advance their price.

ACID, CARBOLIC.—The price continues firm, but some makers are now offering a limited quantity for forward delivery.

ACID, FORMIC.—The market for this has been rather quiet, but the price appears to be quite firm.

ACID, OXALIC.—Considerable inquiry is still maintained for this product, and the price has advanced. The cheap second-hand parcels appear to have been entirely taken off, and business is now being based upon the current makers' quotations.

AMMONIUM SALTS.—There is little change to report.

ARSENIC.—Owing to limited imports, the article is in short supply, and price very firm.

BARIUM SALTS.—The activity previously reported in chloride still continues, and prices seem likely to advance.

BLEACHING POWDER is very scarce for early delivery, but a small quantity of low strength material is offered for export.

COPPER SULPHATE.—There is no change to report in position, but the price has an upward tendency.

FORMALDEHYDE.—The position so far as supplies are concerned is in no way easier, and even the smallest quantities for early delivery are eagerly sought after. The price is again higher, and there is not much prospect of the position getting any better for some time.

LEAD ACETATE.—A heavy inquiry has been received for this product during the last week. Prices are up, and it is fully expected that makers will have to raise their prices again shortly in sympathy with the ever-increasing cost of raw materials.

LITHOPONE.—Arrivals from foreign markets are coming very slowly to hand. The English makers are fully sold, and the article is in very short supply. The price tendency is decidedly upward.

POTASSIUM PERMANGANATE.—An acute scarcity is developing, and much higher prices are reported.

SODIUM ACETATE.—There has been a steady demand during the past week, and prices are fully maintained.

SODIUM NITRITE.—Supplies are reaching this country very slowly, and in very small quantities. High prices are being paid for early delivery, and the general tendency is firmer. The inquiry is still heavy.

SODIUM SULPHIDE.—This product is in great request for early delivery, and prices have been advanced.

SODIUM PRUSSIATE.—The English makers are offering limited quantities for delivery over the second half of this year at high prices. Practically no foreign make is offered, and stocks seem to have been entirely cleared.

ZINC SALTS.—The makers have raised the price for chloride, but there is little inquiry. Sulphate, however, is still in good request.

Coal Tar Intermediates

There is a heavy demand for all Intermediates, and prices are advancing every day. Manufacturers are now refusing to quote for forward delivery, owing to the uncertain position. No spot parcels are available.

ACETANILIDE.—The market is advancing, and there are only limited supplies.

ANILINE OIL.—There is no change to report in this material.

ANILINE SALT.—There are a few parcels available, owing to the suspension of export licences.

BETA NAPHTHOL is a very difficult market at the present moment, and spot parcels are eagerly bought at advanced prices.

NAPHTHIONIC ACID.—There is no change to report.

PARANITRANILINE is unobtainable.

PARAPHENYLENEDIAMINE is advancing in price, and there is a good demand.

SALICYLIC ACID.—The price is considerably firmer, and spot supplies are unobtainable.

Coal Tar Products

The market for all coal tar products remains very firm, and supplies for prompt delivery are somewhat scarce.

90 PER CENT. BENZOL remains at 2s. 1d. to 2s. 1¼d., f.o.r. makers' works.

CRESYLIC ACID is also still in good demand, the price being about 3s. 4½d. for pale 97/99 per cent., and 2s. 10d. for dark 95/97 per cent. quality.

CREOSOTE OIL is very fully booked, and the price remains at 7¼d. makers' works.

NAPHTHALENE.—There is an increased inquiry for naphthalene, refined being worth about £19 to £20. 10s. per ton, and crude from £8 to £9.

SOLVENT NAPHTHA.—The price is in the region of 3s.

HEAVY NAPHTHA.—The price to-day is about 2s. 8d.

PITCH.—There is no change to report. The demand remains good, and prices still show an upward tendency.

Sulphate of Ammonia

Some sales have been made for shipment during April-June next, but only limited quantities are available for that period.

Some business has also been reported for February-March shipment to the British colonies at a price of £33 per ton, f.o.b. U.K. ports.

The Home trade price remains at £21. 7s. 6d. per ton.

Current Prices

Chemicals

	per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	2	9	to	0	3	0
Acetone oil	ton	77	0	0	to	80	0	0
Acetone, pure	ton	90	0	0	to	95	0	0
Acid, Acetic, glacial, 99-100%	ton	85	0	0	to	90	0	0
Acetic, 80% pure	ton	70	0	0	to	73	0	0
Arsenic	ton	70	0	0	to	75	0	0
Boric, cryst.	ton	72	10	0	to	73	10	0
Carbolic, cryst. 39-40%	lb.	0	0	11½	to	0	1	0
Citric	lb.	0	4	3	to	0	4	4
Formic, 80%	ton	110	0	0	to	115	0	0
Gallic, pure	lb.	0	6	6	to	0	6	9
Hydrofluoric	lb.	0	0	7	to	0	0	8
Lactic, 50 vol.	ton	70	0	0	to	72	0	0
Lactic, 60 vol.	ton	85	0	0	to	87	10	0
Nitric, 80 Tw.	ton	37	0	0	to	39	0	0
Oxalic	lb.	0	1	5½	to	0	1	6½
Phosphoric, 1.5	ton	43	0	0	to	45	0	0
Acid, Pyrogallic, cryst.	lb.	0	11	6	to	0	11	9
Salicylic, Technical	lb.	0	2	6	to	0	2	9
Salicylic, B.P.	lb.	0	3	6	to	0	3	9
Sulphuric, 92-93%	ton	7	10	0	to	8	0	0
Tannic, commercial	lb.	0	4	3	to	0	4	6
Tartaric	lb.	0	3	5½	to	0	3	6½
Alum, lump	ton	19	0	0	to	19	10	0
Alum, chrome	ton	93	0	0	to	95	0	0
Alumino ferric	ton	9	0	0	to	9	10	0

	per	£	s.	d.		£	s.	d.
Aluminium, sulphate, 14-15%	ton	15	0	0	to	15	10	0
Aluminium, sulphate, 17-18%	ton	18	10	0	to	19	0	0
Ammonia, anhydrous	lb.	0	1	9	to	0	2	0
Ammonia, .880	ton	32	10	0	to	37	10	0
Ammonia, .920	ton	20	0	0	to	24	0	0
Ammonia, carbonate	lb.	0	0	7½	to		—	
Ammonia, chloride	ton	70	0	0	to	75	0	0
Ammonia, muriate (galvanisers)	ton	47	0	0	to	50	0	0
Ammonia, nitrate	ton	45	0	0	to	50	0	0
Ammonia, phosphate	ton	115	0	0	to	120	0	0
Ammonia, sulphocyanide	lb.	0	1	10	to	0	2	0
Amyl, acetate	ton	310	0	0	to	315	0	0
Arsenic, white, powdered	ton	70	0	0	to	72	0	0
Barium, carbonate	ton	13	0	0	to	14	0	0
Barium, carbonate, 2- 4%	ton	13	10	0	to	14	10	0
Chlorate	lb.	0	1	3	to	0	1	4
Chloride	ton	23	10	0	to	24	0	0
Nitrate	ton	50	0	0	to	51	0	0
Sulphate, blanc fixe, dry	ton	25	10	0	to	26	0	0
Sulphate, blanc fixe, pulp	ton	15	10	0	to	16	0	0
Bleaching powder, 35-37%	ton	18	0	0	to	18	10	0
Borax crystals	ton	39	0	0	to	40	0	0
Calcium acetate, grey	ton	23	0	0	to	25	0	0
Carbide	ton	28	0	0	to	30	0	0
Chloride	ton	9	0	0	to	9	10	0
Carbon bisulphide	ton	58	0	0	to	59	0	0
Casein, technical	ton	80	0	0	to	83	0	0
Cerium oxalate	lb.	0	3	9	to	0	4	0
Chromium acetate	lb.	0	1	0	to	0	1	2
Cobalt acetate	lb.	0	7	0	to	0	7	6
Oxide, black	lb.	0	7	9	to	0	8	0
Copper chloride	lb.	0	1	3	to	0	1	6
Sulphate	ton	44	0	0	to	45	0	0
Cream Tartar, 98-100%	ton	245	0	0	to	250	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde 40% vol	ton	200	0	0	to	205	0	0
Formusol (Rongalite)	lb.	0	4	0	to	0	4	3
Glauber salts	ton	3	10	0	to	3	15	0
Glycerine, crude	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	8	to	0	2	9
Iron perchloride	ton	40	0	0	to	42	0	0
Iron sulphate (Copperas)	ton	4	10	0	to	4	15	0
Lead acetate, white	ton	86	0	0	to	88	0	0
Carbonate (White Lead)	ton	68	5	0	to	70	0	0
Nitrate	ton	65	0	0	to	68	0	0
Litharge	ton	65	0	0	to	67	0	0
Lithophone, 30%	ton	48	10	0	to	50	0	0
Magnesium chloride	ton	15	10	0	to	16	10	0
Carbonate, light	cwt.	2	15	0	to	3	0	0
Sulphate (Epsom salts commercial)	ton	13	0	0	to	13	10	0
Sulphate (Druggists')	ton	17	10	0	to	18	0	0
Methyl acetone	ton	89	0	0	to	90	0	0
Alcohol, 1% acetone	gall.	0	11	6	to	0	12	0
Nickel ammonium sulphate, single salt	ton	47	10	0	to	52	10	0
Potassium bichromate	lb.	0	1	6	to	0	1	7
Carbonate, 90%	ton	102	0	0	to	105	0	0
Chloride	ton	Nominal.						
Potassium Chlorate	lb.	0	1	2	to	0	1	3
Meta-bisulphite, 50-52%	ton	250	0	0	to	260	0	0
Nitrate, refined	ton	65	0	0	to	67	10	0
Permanganate	lb.	0	4	6	to	0	5	0
Prussiate, red	lb.	0	6	0	to	0	6	3
Prussiate, yellow	lb.	0	2	0	to	0	2	1
Sulphate, 90%	ton	31	0	0	to	33	0	0
Salammoniac, firsts	cwt.	4	15	0	to		—	
Seconds	cwt.	4	10	0	to		—	
Sodium acetate	ton	50	0	0	to	53	0	0
Arsenate, 45%	ton	50	0	0	to	52	0	0
Bicarbonate	ton	10	10	0	to	11	10	0
Bichromate	lb.	0	0	11½	to	0	1	0
Bisulphite, 60-62%	ton	35	0	0	to	36	0	0
Chlorate	lb.	0	0	6	to	0	0	6¼
Caustic, 70%	ton	27	10	0	to	28	10	0
Caustic, 76%	ton	27	0	0	to	28	10	0
Hydrosulphite, powder, 85%	lb.	0	3	3	to	0	3	6
Hyposulphite, commercial	ton	21	0	0	to	22	0	0
Nitrite, 96-98%	ton	68	10	0	to	70	0	0
Phosphate, crystal	ton	35	0	0	to	37	0	0
Sodium, Perborate	lb.	0	2	2	to	0	2	4
Prussiate	lb.	0	1	3½	to	0	1	4
Sulphide, crystals	ton	16	0	0	to	16	10	0
Sulphide, solid, 60-62%	ton	28	0	0	to	30	0	0
Sulphite, cryst.	ton	11	10	0	to	12	0	0
Strontium, carbonate	ton	85	0	0	to	90	0	0
Nitrate	ton	85	0	0	to	90	0	0
Sulphate, white	ton	8	10	0	to	10	0	0
Sulphur chloride	ton	40	0	0	to	42	10	0

	per	£	s.	d.		£	s.	d.
Sulphur, Flowers	ton	24	0	0	to	26	0	0
Roll	ton	23	0	0	to	25	0	0
Tartar emetic	lb.	0	3	4	to	0	3	6
Tin perchloride, 33%	lb.	0	2	6	to	0	2	7
Perchloride, solid	lb.	0	2	10	to	0	3	0
Protochloride (tin crystals)	lb.	0	1	10	to	0	1	11
Zinc chloride, 102 Tw.	ton	23	0	0	to	24	10	0
Chloride, solid, 96-98%	ton	50	0	0	to	52	10	0
Oxide, 99%	ton	77	10	0	to	80	0	0
Oxide, 94-95%	ton	60	0	0	to	62	10	0
Dust, 90%	ton	70	0	0	to	72	10	0
Sulphate	ton	21	10	0	to	23	0	0
Oxide, Redseal	ton	75	0	0	to	80	0	0

Coal Tar Intermediates, &c.

	per	£	s.	d.		£	s.	d.
Alphanaphthol, crude	lb.	0	3	0	to	0	3	6
Alphanaphthol, refined	lb.	0	3	6	to	0	3	9
Alphanaphthylamine	lb.	0	3	3	to	0	3	6
Aniline oil, drums extra	lb.	0	1	6	to	0	1	7
Aniline salts	lb.	0	1	10	to	0	2	0
Anthracene, 85-90%	lb.	0	1	5	to	0	1	6
Benzaldehyde (free of chlorine)	lb.	0	6	6	to	0	7	0
Benzidine, base	lb.	0	8	6	to	0	9	0
Benzidine, sulphate	lb.	0	7	0	to	0	7	6
Benzoic, acid	lb.	0	5	0	to	0	5	3
Benzoate of soda	lb.	0	5	0	to	0	5	3
Benzyl chloride, technical	lb.	0	2	3	to	0	2	6
Betanaphthol benzoate	lb.	1	6	0	to	1	7	6
Betanaphthol	lb.	0	3	6	to	0	3	9
Betanaphthylamine, technical	lb.	0	7	0	to	0	7	6
Croceine Acid, 100% basis	lb.	0	4	9	to	0	5	0
Dichlorbenzol	lb.	0	0	5	to	0	0	6
Diethylaniline	lb.	0	7	0	to	0	7	6
Dinitrobenzol	lb.	0	1	3	to	0	1	4
Dinitrochlorbenzol	lb.	0	1	3	to	0	1	4
Dinitronaphthaline	lb.	0	1	4	to	0	1	6
Dinitrotoluol	lb.	0	1	7	to	0	1	8
Dinitrophenol	lb.	0	1	3	to	0	1	6
Dimethylaniline	lb.	0	3	6	to	0	3	9
Diphenylamine	lb.	0	4	0	to	0	4	6
H-Acid	lb.	0	12	6	to	0	13	6
Metaphenylenediamine	lb.	0	4	9	to	0	5	0
Monochlorbenzol	lb.	0	0	9	to	0	0	10
Metanilic Acid	lb.	0	7	6	to	0	8	6
Monosulphonic Acid (2:7)	lb.	0	7	0	to	0	8	0
Naphthionic acid, crude	lb.	0	4	0	to	0	4	6
Naphthionate of Soda	lb.	0	4	3	to	0	4	6
Naphthylamin-di-sulphonic-acid	lb.	0	4	6	to	0	5	0
Nitronaphthaline	lb.	0	1	4	to	0	1	5
Nitrotoluol	lb.	0	1	3	to	0	1	6
Orthoamidophenol, base	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	1	to	0	1	3
Orthotoluidine	lb.	0	2	2	to	0	2	3
Orthonitrotoluol	lb.	0	1	6	to	0	1	9
Para-amidophenol, base	lb.	0	14	0	to	0	15	0
Para-amidophenol, hydrochlor	lb	0	15	6	to	0	16	0
Paradichlorbenzol	lb.	0	0	4	to	0	0	5
Paranitraniline	lb.	0	5	6	to	0	6	0
Paranitrophenol	lb.	0	3	0	to	0	3	3
Paranitrotoluol	lb.	0	5	3	to	0	5	6
Paraphenylenediamine, distilled	lb.	0	13	0	to	0	13	6
Paratoluidine	lb.	0	7	0	to	0	7	6
Phthalic anhydride	lb.	0	9	6	to	0	10	6
R. Salt, 100% basis	lb.	0	5	0	to	0	5	6
Resorcin, technical	lb.	0	11	0	to	0	12	0
Resorcin, pure	lb.	0	17	6	to	1	0	0
Salol	lb.	0	4	9	to	0	5	6
Shaeffer acid, 100% basis	lb.	0	4	0	to	0	4	6
Sulphanilic acid, crude	lb.	0	1	6	to	0	1	8
Tolidine, base	lb.	0	12	0	to	0	12	6
Tolidine, mixture	lb.	0	2	9	to	0	3	0

Price of Chilean Nitrate

A CABLEGRAM received from Chile last week announced that the tender held on the 9th inst. for the sale of 100,000 tons May/June to the highest bidder over 12s. had resulted in a price of 12s. 9½d. per quintal being paid for this lot. The market has consequently become much firmer, and quotations for any position this year are now about 13s. per quintal. Since January 8, the European market, according to Messrs. Thomson Aikman, Junr.'s report, has been active, with a very strong demand from consumers, and several cargoes January/February shipment are reported sold at 24s. to 24s. 3d. per cwt. c.i.f. At the close, owing to scarcity of sellers, quotations are nominal at about 25s. for this position. Business f.o.b. was reported for January/December, 1921, at about 11s. 5½d., but at the close the value of this position is decidedly higher, sellers holding off. Freights continue dull at about 190s. per ton for near loading, and for later positions this year about 150s. is asked, with charterers offering about 100s. to 120s. per ton.

Company News

SANTIAGO NITRATE.—The net profit for the year to June 30 last amounts to £42,033, which, with £42,072, makes a total of £84,105. A dividend of 7½ per cent., less tax, is proposed.

AMERICAN CYANAMID CO.—The directors have declared a dividend of 3 per cent. ($3 per share) on the preferred stock in respect of the six months to December 31, 1919, payable January 2, 1920, to stockholders on record December 22, 1919.

BOOTLE COLD STORAGE & ICE CO.—A further dividend of 5 per cent. has been declared, making 10 per cent., less tax, for 1919, as well as a bonus of 3 per cent., free of tax. £1,000 has been placed to depreciation fund, and £1,000 to reserve and sinking fund.

BRITISH CYANIDES CO.—At an extraordinary general meeting held on Wednesday it was unanimously resolved to increase the capital of the company to £450,000 by the creation of 100,000 new shares of £1 each, and to make arrangements to obtain an official quotation on the Stock Exchange.

ANGLO-UNITED OILFIELDS.—The directors state that the transfer of the property acquired by the company has been completed. Stocks of oil on the field, rigs for boring and material for lining the new walls have been acquired on a satisfactory basis. The manager is now on the field and is arranging for the cleaning out of existing wells and the development of the property generally.

BRITISH DYESTUFFS.—The directors have decided to pay a dividend on the preference shares for the period ended October 31 last at the rate of 7 per cent. per annum. They are not yet in a position to present the accounts for the year to October 31, but they are satisfied that the profits are such as will enable them to recommend a dividend on the preferred ordinary shares at the rate of 8 per cent. per annum.

BROKEN HILL PROPRIETARY, BLOCK 14.—The net profit for the half-year ended September 30 was £9,296, against £8,009, which, added to £44,504 brought forward, makes a total of £53,800. After providing £1,500 for the payment of half-yearly interest on the preference shares at September 30, a balance of £52,300 is carried forward. The surplus of liquid assets over liabilities amounts to £57,390. The company's holding in the King Isla Scheelite Mine consists of 30,450 shares, on account of which a dividend (the fourth) of 1s. per share was received on April 16 last, amounting to £1,973.

KAMUNTING TIN DREDGING.—Shareholders on the register on January 10 are offered, pro rata, 130,000 shares of £1 each, at 30s. per share, payable 5s. per share on application, 5s. (which includes 2s. 6d. premium) on allotment, and 5s. (which includes 2s. 6d. premium) one month after allotment; the balance of 15s. will be called up as required in calls not exceeding 5s. each. The right of renunciation is given and shares in excess of the pro rata allotment may be applied for. In the case of colonial and foreign shareholders, the sum of 15s. per share is payable on application, this amount including 5s. on account of premium.

GUEST, KEEN & NETTLEFOLDS & JOHN LYSAGHT.—Particulars of the offer from Guest, Keen & Nettlefolds, Ltd., for the purchase of the ordinary shares in John Lysaght, Ltd., have now been issued to the ordinary shareholders of the last-named company. Three ordinary shares and four 5 per cent. cumulative second preference shares (free of income tax), ranking *pari passu* with the present issue of this class of shares in Guest, Keen & Nettlefolds, carrying dividends as from January 1, 1920, are offered for every three ordinary shares in John Lysaght. No fractions of shares will be issued, but any fraction of a share will be satisfied in cash on the footing that the second preference shares of Guest, Keen & Nettlefolds are worth the nominal amount thereof. The directors also recommend the creation of 2,000,000 Ordinary and 3,000,000 Second Cumulative Preference shares of £1 each, thereby increasing the authorised share capital of Guest, Keenand Nettlefolds to £15,000,000.

VAN DEN BERGHS.—The report covering a period of 5¼ years, from January 1, 1914, to June 30, 1919, shows a profit of £2,978,729, including £209,111 brought in at December 31, 1913, after deducting all charges, including depreciation, income tax, directors' remuneration, managing directors' and managers' salaries and bonuses, &c. Deducting dividend on preference shares from January 1, 1914, to February 28, 1919, £139,500, and dividend on "B" preference shares from January 1, 1914, to June 30, 1919, £330,000, and interim dividends on ordinary shares, £750,000; carried to reserve, £158,147 (bringing that fund to the total amount provided for in the articles of association, viz., £500,000), the undivided balance is £1,601,082. This sum it is proposed to apply as follows: Accrued proportion of preference dividend to June 30, 1919, £9,000; final dividend at the rate of 17½ per cent. on the ordinary shares (on account of which 10 per cent. was paid on October 2, 1919), making a total distribution at the rate of 25 per cent. per annum for the whole period covered by this report, £109,375, leaving £1,482,707 to meet the liability for excess profits duty for the 5¼ years and contingencies. The directors are of opinion that after final settlement of these liabilities a substantial balance will remain. An extraordinary general meeting is to be held for the purpose of considering proposals for altering and increasing the capital of the company.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

London Gazette

Partnership Dissolved

McCARTHY, MICHAEL, and COPE, GEORGE ALMA, lime burners and stone merchants, Bulwell Lime Works, Bulwell, Nottingham, under the style of McCarthy & Cope, by mutual consent. All debts received and paid by Michael McCarthy, who will carry on the business.

Companies Winding Up Voluntarily

NEW BERCA PETROLEUM CO., LTD. (in voluntary liquidation).—A general meeting will be held at 5, Clifford Street, Bond Street, London, W. 1, on Tuesday, February 24, at 12 noon. B. Murton Gill, liquidator.

PETROLEUM EXPLORATION CO., LTD.—Winding up voluntarily for the purpose of amalgamation with the Trinidad National Petroleum Co., Ltd. A meeting of creditors will be held at 15, Angel Court, Throgmorton Street, E.C., on Monday, February 2, at 3 p.m. W. A. Habberfield, liquidator.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, created after July 1, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.*]

BARHAUGH ANTHRACITE & LIMESTONE CO., LTD., ALSTON (CUMB.).—Registered January 7, £390 (and further advances), debentures, to F. M. Dryden, 6, Market Street, Newcastle-on-Tyne; general charge. *——. May 31, 1919.

BELL'S UNITED ASBESTOS CO., LTD., LONDON, S.E.—Registered January 5, £10,000 debentures, part of £100,000; general charge. *£85,725. 11s. 7d. June 19, 1919.

CASEIN, LTD., BATTERSEA, S.W.—Registered January 5, £10,000 debentures; general charge. *——. January 23, 1919.

SAPON SOAPS, LTD., LONDON, E.C.—Registered January 5, £20,000 debentures, to C. Gow, 5, Princes Street, E.C., and another; general charge. *Nil. January 2, 1919.

V.C. GLASS MANUFACTURING CO., LTD., NEW SOUTHGATE, N.—Registered December 23, Trust Deed dated December 3, 1919, securing £10,143. 5s. 4d.; charged on land and buildings at Bounds Green Road, Wood Green, with plant machinery, &c., also general charge. *Nil. December 31, 1918.

County Court Judgments

NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

SCOTT, ALFRED RITCHIE, 15, High Street, New Whittington, analyst. £27. 9s. 7d. December 3.

AISIKOFF, M., 430, Mile End Road, London, E., doctor and drug stores proprietor. £11. 13s. December 8.

BARTON, ARCHIBALD THOMAS, Redcroft, 6, Shalimar Terrace, Horn Lane, Acton, chemist. £37. 16s. 9d. November 19.

Bill of Sale

[*The undermentioned information is from the Official Registry. It includes Bills of Sale registered under the Act of 1882 and under the Act of 1878. Both kinds require re-registration every five years. Up to the date the information was obtained it was registered as given below; but payment may have been made in some of the cases, although no notice has been entered on the Register.*]

PARRISH, JAMES EDWARD (and Clara Alice Parrish, his wife), 361, High Street, Rochester, chemist, and another. Filed January 16. £72.

New Companies Registered

The following list has been prepared for us by Jordan & Sons Ltd., Company Registration Agents, 116 and 117, Chancery Lane London W.C.:—

CLEM P. CLAYTON CO., LTD.—Horticultural and agricultural chemists. Nominal Capital, £2,000 in 2,000 Ordinary shares. Directors to be appointed by subscribers. Qualification of Directors, 1 share. Subscribers: C. P. Clayton, 187, Hertford Road, Enfield Wash, Middlesex; A. Robin, 207, Ordnance Road, Enfield Lock.

CLOUGH'S, JOHN, SUCCESSORS, LTD., Westhulme Oil and Chemical Works, Oldham.—Manufacturing chemists, chemical brokers, oil refiners, &c. Nominal Capital, £10,000 in 10,000 shares of £1 each. Directors: J. M. Collinge, The Snead, Abberley, near Worcester (Chairman and Governing Director); D. Collinge: J. E. Collinge. Qualification of Directors, £250.

FALCONER, CAMPBELL & CO., LTD., 102, Walmgate, York.—Distillers of essences and general manufacturers of foods and drugs. Nominal Capital, £6,000 in 5,950 shares of £1 each, and 1,000 employees' shares of 1s. each. Directors: C. Falconer, The Hall, Osbaldwick, York (Chairman); H. G. Masterton, The Hall, Osbaldwick, York; F. H. Masterton, The Cross, Sherburn, York; Alice M. Falconer, The Hall, Osbaldwick, York. Qualification of Directors, £500.

Petroleum Exploitation Co.

In the Companies Winding-up Court of the Chancery Division on Tuesday, Mr. Justice P. O. Lawrence had before him the petition of H. G. Teale for the compulsory winding-up of Petroleum Exploitation Co., Ltd.

Mr. Owen Thompson, K.C., for the petitioner, said this was a petition based on the ground that the substratum of the company had gone. The substratum consisted of an option over oil-bearing lands in Roumania, and it was now possible that the substratum might be revived under the new conditions. It was hoped that the option would be renewed, and he asked that the petition should stand over.

Mr. Haydon, for the company, and an opposing shareholder assented, and

His Lordship ordered the petition to stand over to the first company day of next sittings.

———

Consequent upon the appointment of Mr. E. S. Grey, Senior Official Receiver attached to the High Court in Bankruptcy, to be Controller of the Clearing Office for Enemy Debts, the President of the Board of Trade has appointed Mr. William Percy Bowyer to be Senior Official Receiver, Mr. Daniel Williams, hitherto Senior Assistant Official Receiver, to be Official Receiver, and Mr. Frank Townsend Garton, Assistant Official Receiver, to be Senior Assistant Official Receiver.

Situations Vacant

(Three lines, 3s.; each additional line, 1s.)

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